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# SCIENCE GRADE 5

UNIT ONE Lessons 1-11

ALBERTA DISTANCE LEARNING CENTRE

Alberta EDUCATION

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# Science 5

## Unit 1

# LESSONS 1-11

Alberta
EDUCATION

Science 5
Student Module
Unit 1
Lessons 1-11
Alberta Distance Learning Centre
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The textbook you will be using this year is Concepts in Science 5.

In Grade 5 science, we are going to explore different parts of our world. We will go into space and down to the centre of our Earth. We will ask questions about what we observe. We will try to explain why things happen. Investigations will test our ideas. Models will help us understand ideas. Conclusions and hypotheses will be made about our world.

You're invited to come along and explore.

In the first unit we will be exploring the world of the geologist. A geologist is often called an Earth Scientist. His laboratory is our whole Earth, inside and outside. His questions about our Earth may take him to the top of the mountains, to the bottom of the sea, or to the very centre of the Earth.

He asks questions as; why do volcanoes occur? Is our Earth really as solid and firm as we think? What causes earthquakes? Why are there land forms like towering mountains, such as the Rocky Mountains, or deep canyons as Grand Canyon? What caused them to be? Are they changing? What makes them change? How does this change affect other parts of our Earth?

The geologist wants to understand his laboratory, the Earth. These are only a few of the questions he will ask. These are some of the questions we will investigate as we explore Our Earth-Inside and Out.

In our investigations and exploring we will keep a record of what we do. The following is what we will call our record:

PROBLEM: This tells what question it is that we are trying to answer or understand.

MATERIALS: These are all the things we need to use when doing our investigation.

PROCEDURE: This part tells us just what to do.

RESULTS: In this section we observe (see, taste, smell, hear or feel) and describe exactly what we observe.

CONCLUSION: Here we try to explain why things happen as they do in our investigation. The conclusion answers the question from the problem section.

Note: The exercises – Something for You to Do are interest exercises which may be completed and discussed with your supervisor.

## A LESSON RECORD FORM MUST BE COMPLETED FOR EVERY LESSON SUBMITTED FOR CORRECTION, AS ILLUSTRATED BELOW

A Lesson Record form with the **correct** label attached **must** be enclosed with **every lesson** submitted for correction, as illustrated below.

Correct use of these labels will ensure prompt processing and grading of your lessons.

The enclosed **Lesson Labels** must be checked for spelling and address details.

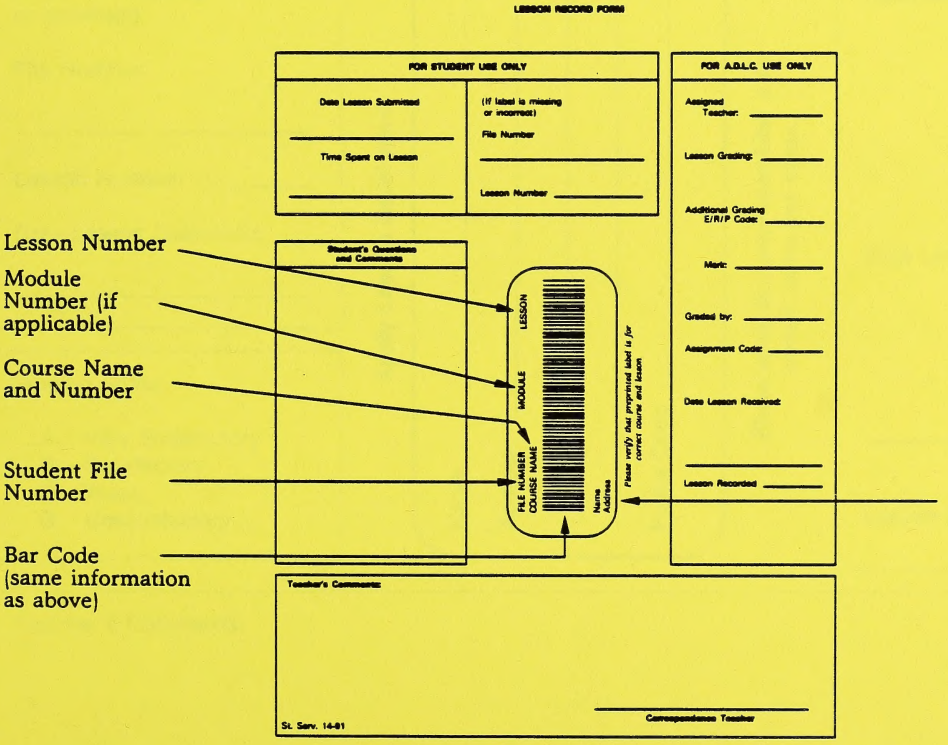
Please advise the Alberta Distance Learning Centre promptly of any changes in name, address, school, or any other details and we will issue a revised set of labels. Your file number is permanently assigned and **must** be included on all correspondence with the Alberta Distance Learning Centre. If the proper label and Lesson Record Form is not attached to each lesson as indicated it will delay your lessons being processed and credited to you.

Lesson labels are to be attached to the **lesson record forms** in the space provided for student name and address.

Check carefully to ensure that the **subject name, module number** and **lesson number** on each label corresponds exactly with the lesson you are submitting.

Labels are to be **peeled** off waxed backing paper and **stuck** on the lesson record form.

Only **one** label is to be placed on each lesson.




**When revised labels are received, place the correct new labels on your Lesson Record Forms.**

**DO NOT MARK OR COVER BAR CODING.**

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If the address on your lesson record form differs from the address you supplied on your registration application, please explain. Indicate whether the different address is your home, school, temporary or permanent change of address.

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**0504 Science**
Unit I
Revised 03/91

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Assigned
Teacher: _____

Assignment
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Lesson Grading
Science: _____
Health: _____
Neatness: _____

Date Lesson Received:

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Sc. 5-1-86

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(2) All exercises are completed. If not, explain why.
(3) Your work has been re-read to ensure accuracy in spelling and lesson details.
(4) The Lesson Record Form is filled out and the correct lesson label is attached.
(5) This mailing sheet is placed on the lesson.

### 2. POSTAGE REGULATIONS

Do **not** enclose letters with lessons.

**Send all letters in a separate envelope.**

### 3. POSTAGE RATES

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**Take your lesson to the Post Office and have it weighed. Attach sufficient** postage and a green first-class sticker to the front of the envelope, and seal the envelope. Correspondence lessons will travel faster if first-class postage is used.

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**When you register for correspondence courses, you are expected to send lessons for correction regularly. Avoid sending more than two or three lessons in one subject at the same time.**

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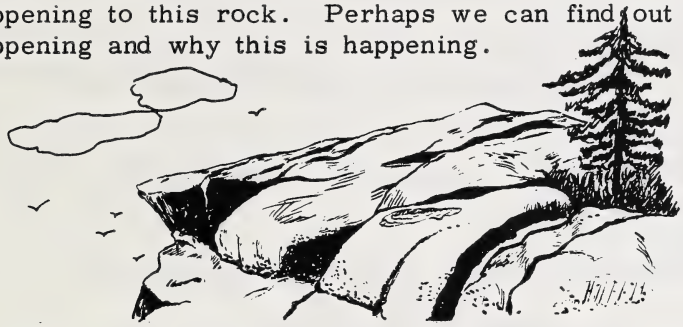
FIRST DAY

Now we are ready to explore and investigate change on our Earth. Look at the picture of the rock below. Something is happening to this rock. Perhaps we can find out what is happening and why this is happening.



1. From what you see, tell me what seems to be happening to the rock.

_____

_____

_____

The onion-like peeling of rock.

2. Can you suggest some reason for this rock to be peeling and cracking?

_____

_____

_____

During the daytime the sun warmed the outside of the rock. The molecules that make up the rock, spread out or expanded.

In the evening when the air was cool, the outside layer of the rock was cooled. This cooling caused the rock molecules to contract or come close together again. The inner part of rock does not heat up as quickly, or as much as the outer layer of rock. This unequal heating and cooling of the rock causes a strain in the rock. Finally the outer layer of rock begins to peel off.

Building a model will help you understand how this cracking and peeling of rocks occurs.

PROBLEM: To build a model that will help us understand how rocks crack and peel

MATERIALS: laundry soap, water, and a balloon

PROCEDURE:
1. Make a THICK mixture of water and laundry soap.
2. Blow up the balloon.
3. Spread the soap mixture over the balloon and allow it to dry completely.
4. SLOWLY release the air from the balloon.

RESULTS: What happened to the soap as you released the molecules of air from the balloon?

_____

_____

_____

_____

_____

_____

CONCLUSION: Circle the right answer in the following exercise.

BALLOON

1. Molecules of air took up (less, more) space when you blew into the balloon. We say the molecules of air (expanded, contracted).

2. The molecules of air in the balloon took (less, more) space when we released some of the molecules. We say the air molecules (contracted, expanded).

3. When the molecules of air in the balloon contracted the soap began to:

_____

_____

ROCK

1. The sun's heat caused the molecules of rock to take up (more, less) space. We say the molecules that compose rock (expanded, contracted).

2. The molecules of rock in the outer layer took up (less, more) space when the air became cool. We say the rock (contracted, expanded).

3. When the rock contracted the outer layer began to:

_____

_____

Check your answers with those at the end of Lesson 1.

From the investigation we learn that:

The sun causes changes on our Earth. The rock will continue to peel. This part that peels provides some of the soil for a tiny plant to start growing.

The sun helps break down rock and so changes something on our Earth.

For next day's work prepare the following:

MATERIALS: Two plastic containers with lids (cottage cheese type), water, and a fridge.

PROCEDURE:
1. Fill both containers with water to the top.
2. Put lids on both containers and place one of them in the freezer part of your fridge until tomorrow.
3. Leave the other container on a shelf near the fridge.

## SECOND DAY

Yesterday we saw how the sun is involved in bringing change on our Earth. Today we will investigate more change on our Earth.

Do you think ice could possibly make any changes in our world? _____ If you said yes, what kind of changes do you think ice could produce?

_____

_____

_____

_____

Do you think ice could help break down a rock? _____ If you said yes, explain how ice could help break down a rock.

_____

_____

_____

_____

PROBLEM: To find if it is possible for ice to help break down a rock

MATERIALS: The containers you put into the fridge yesterday

PROCEDURE: The container in the freezer is called the test container.
The container on the shelf is called the control container.

RESULTS: Has anything happened to the containers? If so, what has happened, and to which container? Write your answers in the spaces provided on the next page.

TEST CONTAINER (ICE)

CONTROL CONTAINER (WATER)

In one investigation, the lid on the test container was off. Explain why the lid would be off the test container.

Water is a peculiar substance. When it freezes, the molecules spread out or expand. The molecules of ice took up more room. They forced the lid off the container. After seeing how ice pushed the container lid off, we can come to a conclusion about ice.

CONCLUSION: How do you think ice might help break down rocks?

Water may collect in the smallest crack in a rock. It may freeze and expand, forcing the crack to open wider. This may happen many times, gradually breaking down the rock into smaller pieces. The soil from peeling rock, and the cracks in rocks, provide a place for small plants to grow.

Can you think of a reason for using the control container?

A control is used in an investigation as a check. It helps us to be sure of knowing what it is that causes the change in our investigation.

Something for You to Do

1. Why is it important for plant and animal life in water, that water expands when it freezes? Perhaps you can think of an answer now. Perhaps you will have to do some research.

2. Why is it important that water in pipes be kept flowing in very cold weather?

3. A carton of milk was forgotten outside on a very cold day. The milk froze and the carton bulged. Why was the carton bulging?

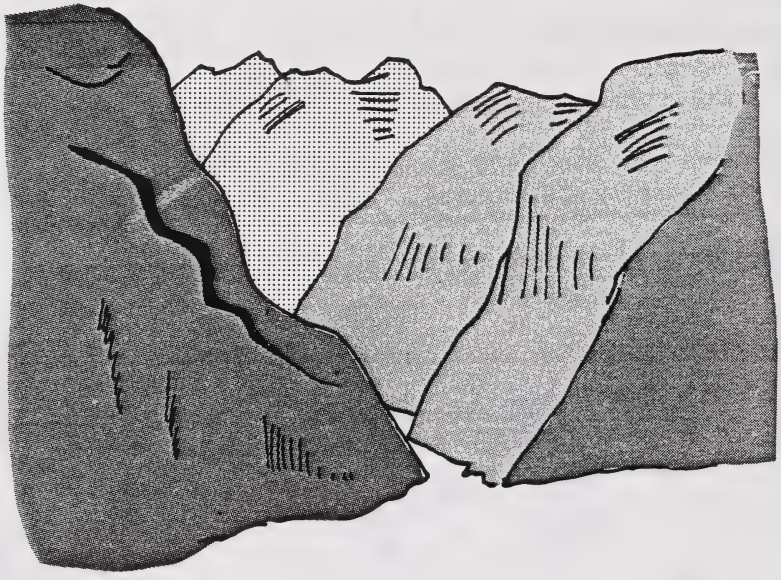
Check your answers for pages 5 and 6 with those at the end of Lesson 1.

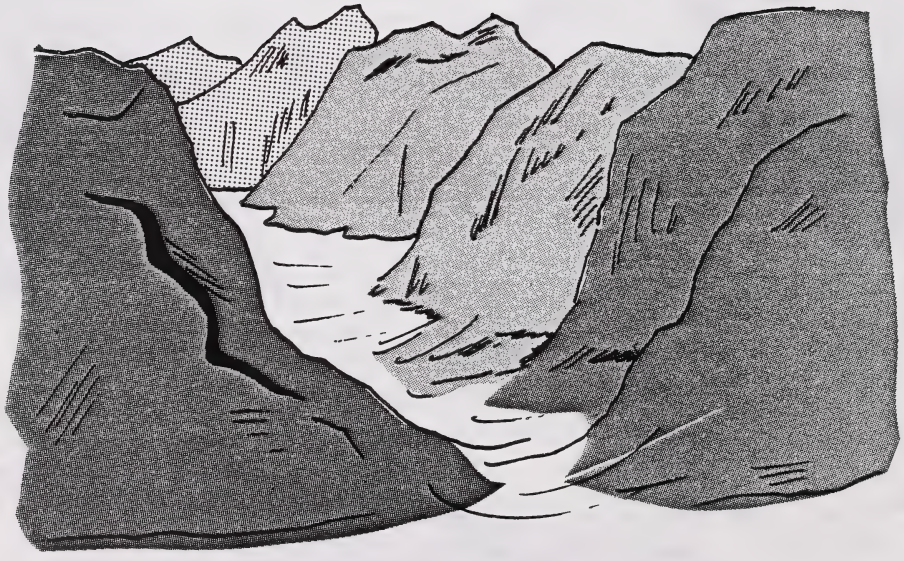
## Rivers of Ice

Some of the Earth's most noticeable changes are made by glaciers in valleys. Glaciers are often called Rivers of Ice, since they do move. They may move a few metres each year. When glaciers move they drag boulders and all sizes of rocks across the Earth's surface, like a huge scouring pad. As the glacier melts, much of the boulders, rocks, and debris are left standing in hills at the base of the glacier. Often the melting ice will collect in a lake.

Some glaciers are 300 - 900 metres thick. Glaciers change our Earth by scraping its surface.

Next time you are in the mountains looking down a valley, take note of the shape of the valley. If the valley is U-shaped it is possible a glacier formed the valley. The ice melted but the valley remains as a result of a glacier. How do you think the V-shaped valley was formed?





## THIRD DAY

The strange formations above are called Hoodoos. These can be found in the area of Drumheller, Alberta. This area is often referred to as the badlands.

From what you can see, how do you think these particular land forms were made?

_____

_____

_____

_____

_____

_____

_____

_____

We can build a model of the Hoodoos to check our ideas on how these Hoodoos were formed.

PROBLEM: To build a model that will help us understand how Hoodoos are formed

MATERIALS: A baking pan with sides, container of water, and sand (or the backyard soil if sand is not available)

PROCEDURE:
1. Place the sand in the baking dish, in a large mound.
2. In a few places press the sand down hard with your fingers or fist. Pack it in these areas.
3. Make it rain on the sand. Pour the water slowly and then a little more quickly over the sides of the pan.
   - Watch to see what happens to the sand.
   - Are the areas that you pressed down being washed away, or are they standing more firmly?

RESULTS:
1. What happened to the sand as you made it rain?

_____

_____

_____

_____

2. What happened to the areas that you pressed down? Did they wash away, or were they left standing?

_____

_____

_____

_____

_____

_____

_____

CONCLUSION: From the model you built, explain how the Hoodoos of the Badlands may have been formed.

_____

_____

_____

_____

_____

_____

_____

This model shows us how Hoodoos are formed. In some areas the soil is of the type that is more tightly packed together. These areas are not as easily washed away as the looser soils.

We see that water changes our Earth. When water washes away soil we call this EROSION (i-rō-zhen). Water also carries the bits and pieces of rock which have been broken down by ice, plants, and the sun. Water changes our Earth.

Something for You to Do

1. Find ways in which to help prevent erosion, using soil, a pan and water. Would a cover of some sort help prevent it from eroding when you pour water on it? Try using paper or leaves. Some research will show you that there are numerous ways in which soil erosion can be prevented.

2. Do different soils erode faster than others? If possible use sand, clay, and humus soils to build the same model as in today's work. What is it that makes sand, clay, and humus soils different?

3. Take a walk along a river or stream to find evidence of water erosion.

Check your answers for pages 10 and 11 with those at the end of Lesson 1.

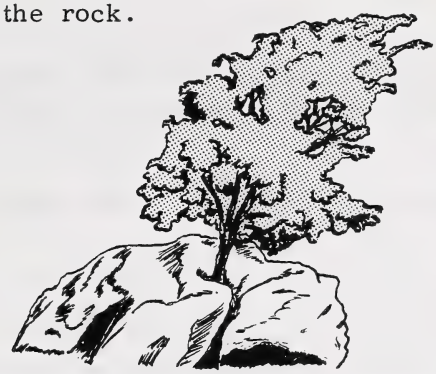
For tomorrow's work prepare the following:

MATERIALS: In your science kit find a package of lima beans. Get a plastic container with a lid. You will also need a paper bag.

PROCEDURE:
1. Fill the plastic container to the top with lima beans.
2. Fill the container with water.
3. Put the lid on tightly.
4. Place the container in the bag and set aside until your next day's work.

## FOURTH DAY

Let's continue our exploring by studying the picture of the plant growing in the rock.



It is perhaps very hard to understand how a delicate plant could possibly have anything to do with change on our Earth. We can do a study of plants to learn about changes on our Earth.

PROBLEM: To discover if plants could possibly bring about a change on Earth

MATERIALS AND PROCEDURE: The lima beans you prepared yesterday

RESULTS:

1. Describe everything you see that has happened to the container.

_____

_____

_____

_____

2. Compare a container bean with a non-container bean. If there is a difference, describe it.

_____

_____

_____

_____

3. Is there any water left? _____
Where do you think the water went?

_____

_____

_____

4. How did the lid come off the container?

_____

_____

_____

In one investigation, the lid on the container was off. There was no water left in the container. The beans looked swollen compared to non-container beans. On some of the beans the beginning of a sprout could be seen. What happened?

The water had entered the beans and the beans were in the very beginning stages of growing. The beans swelled as they took in more water. Swollen beans took up more room and so pushed the cap off the container.

CONCLUSION: If lima beans can lift off a container cap, how might a plant growing out of a crack in a rock bring about change?

_____

_____

_____

_____

_____

_____

_____

Check your answers for pages 13 and 14 with those given at the end of Lesson 1.

Growing plants create enough force to make rocks crack wider. Slow as this change may seem, it is change on our Earth.

## FIFTH DAY

Concepts in Science, pages 4 - 9

We have been discussing and investigating ways in which our Earth is changing. By reading pages 4 - 9 in your text you will find how wind helps change our Earth and what weathering agents are.

1. In a few sentences tell how wind changes our Earth.

2. What might the wind have to do with a tiny plant seed?

3. How might the wind affect the Hoodoos we talked about this week?

4. What is the job of weathering agents?

5. Give some examples of weathering agents that we have investigated this week.

Now you are ready to do the questions on pages 9 and 10, Before You Go On.

A. 1.

2.

3.

4.

B.

SEND FOR CORRECTION

We can investigate ways in which our Earth is changing because of the sun, water, ice, plants, and wind.

Underline the correct answer.

1. Our Earth is always changing.
2. Our Earth changes once in a while.
3. Our Earth has stopped changing.

Tell why you chose the answer you did.

_____

_____

_____

_____

_____

_____

_____

SEND FOR CORRECTION

Something for You to Do

1. Find pictures in magazines that show how weathering agents have affected our Earth. Paste the pictures on the following page. Write a sentence telling about the weathering agents.

2. You may wish to take pictures of changes on Earth caused by weathering agents. Collect these and put them into a scrapbook.

SEND FOR CORRECTION

ANSWERS TO LESSON 1

Page 2 Results: The soap should crack and peel off.

Page 3

| Balloon | Rock |
|---|---|
| 1. more, expanded | 1. more, expanded. |
| 2. less, contracted | 2. less, contracted |
| 3. crack and peel | 3. crack and peel |

Page 5

| Ice | Water |
|---|---|
| You should find the container has bulged and the lid has come off. | This container should be the same as yesterday. |

The lid would be off the test container because the water molecules expanded as they froze and pushed the lid off.

Ice can help break down rocks by expanding as it freezes in cracks. As it expands, it puts pressure on the rock, causing the crack to widen and eventually break the rock apart.

Page 6

The control container is used to show that it is the freezing water which pushes the lid off. It sort of checks our experiment so we can tell what causes the result we got.

1. When water freezes, it floats and provides a sort of blanket of insulation so plants and animals can live beneath it.

2. Flowing water does not freeze as easily as water which is still. This is why rivers take longer to freeze than ponds. If the water in the pipe is kept flowing, then it cannot turn to ice and expand and burst the pipe.

3. Milk is made up mostly of water. When the water freezes, it expands and forces the carton to bulge.

Pages 10, 11

1. The water washes the sand away.

2. The pressed down areas took longer to wash away. They were left standing longer.

Conclusion: Some parts of land are harder than others and take longer to be washed away by rain.

Pages 13, 14

1. You might see bulges in the container or perhaps the lid has been pushed off.

2. The container bean should be larger, softer and less wrinkled.

3. Most or all of the water should be gone. The water has been absorbed by the beans.

4. As the water went into the beans, they swelled up and put pressure on the lid. When the pressure got to be too much, the lid popped off.

Conclusion: As the plant grows, it puts pressure on the crack in the rock, pushing it wider apart until the rock eventually breaks.

# LESSON RECORD FORM

**0504 Science**
Unit I

Revised 03/91

Parent's or Supervisor's Comments:

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Assigned Teacher: _____

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Lesson Grading
Science: _____
Health: _____
Neatness: _____

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# FIRST DAY

For the last few days, through observing, describing and explaining, we found changes in our world. Weathering agents produce many of the changes. Water, a weathering agent, causes some of the most noticeable changes. The Hoodoos and Grand Canyon are the results of the action of water. Gullies on farmland or even in your garden are often caused by running water.

Running water erodes or washes soil away. What happens to the soil, rocks and materials that rivers pick up? To answer this question we must have a closer look at running water.

Let's begin by looking for things that will affect (bring about, cause) how much material is carried by water. Do you think the speed of running water will make any difference in how much soil is washed and carried away? _____ If you said yes, tell how you think the speed of running water will affect the amount of material it carries.

_____

_____

_____

_____

We can test our ideas in the following investigation.

PROBLEM: To discover what happens to sand stirred up in a jar of water

MATERIALS: sand, jar, water and a spoon

PROCEDURE:
1. Put the sand and water in the jar.
2. Stir the water vigorously with the spoon.
3. Stop stirring and WATCH WHAT HAPPENS UNTIL THE WATER IS STILL.

RESULTS:
1. What happened as you stirred the water?

_____

_____

_____

2. What happened to the WATER when you stopped stirring it?

_____

_____

3. What happened to the SAND when you stopped stirring the water?

_____

_____

CONCLUSION: In the jar, how did the speed of swirling water affect how much sand stayed in the water?

_____

_____

_____

_____

From what you have seen, how do you think the speed of running water affects how much material the water can carry?

_____

_____

_____

_____

_____

_____

Check your answers with those at the end of Lesson 2.

## SECOND DAY

Concepts in Science 5, pages 11 - 15

Last day we found that water which moves quickly, is able to carry sand. When running water slows down, the sand begins to fall to the bottom. We call this settling.

Rivers, however, carry more than just sand. Soil, pebbles, gravel and larger rocks are also carried. Do you think these materials will settle?

_____

Why do you think this?

_____

_____

Do you think that materials like pebbles, gravel, soil and rocks will settle at exactly the same time as the sand? _____ Why?

_____

_____

Let's test our ideas.

PROBLEM:

1. To find out if pebbles, gravel, soil and sand will settle
2. To find out if pebbles, rocks, gravel and sand all settle at the same time

Set up the investigation as suggested on page 15 of your science textbook. Watch very closely, thinking of the questions we want to answer.

RESULTS:

1. Did all of the materials settle? _____
2. Did all the materials settle at the same time? _____ If not, make a list of the materials in the order in which they settled.

_____

_____

_____

CONCLUSION: In this investigation, did different materials settle at different times? _____

Will the same thing happen in a river carrying these materials? _____

Check your answers with those at the end of Lesson 2.

## THIRD DAY

For the last two days we have been investigating things which effect how much material a river can carry. We found that the faster a river runs, the longer it carries its passenger, the sand. On the second day, we found that bigger materials settle before smaller materials. In short, speed of water and size of materials being carried affect how much material is carried.

Set up the same investigation as on the Second Day. This time watch for this: How fast is the water moving when pebbles, gravel, sand and soil each settle?

When you have done this you will be able to fill in the chart below. To fill in the chart ask yourself this question: When each material settled was the water moving fast, less fast, slow, or slower? Put a ( √ ) check mark in the correct column.

Settling
Depends on:

SPEED OF WATER

| SIZE OF MATERIALS | fast | less fast | slow | slower |
|---|---|---|---|---|
| Gravel | | | | |
| Pebbles | | | | |
| Sand | | | | |
| Soil | | | | |

SEND FOR CORRECTION

## FOURTH DAY

Running water carried small and large materials. We found that coarse materials like pebbles settle sooner than fine materials like soil and sand.

The streams and rivers from mountains and lakes finally run into the ocean. Whether it is a rushing river or a quiet stream entering the ocean, the material these waters carry will settle. This happens all day long for many years. Gradually the materials turn into a rock called SEDIMENTARY ROCK. What do you think holds these materials together to form rock?

_____

_____

_____

_____

_____

Perhaps building a model will help you understand better, how sedimentary rock is formed. It is best to do this model outside.

PROBLEM: To find what it is that makes sand stick together

MATERIALS: 2 small pails, and backyard sand or soil

PROCEDURE:

| Pail 1 | Pail 2 |
|---|---|
| Fill the pail with sand. Turn it upside down on the ground. Lift the pail off. | Fill the pail with sand. Press down on the sand very hard with your hand. Pack it! Turn the pail upside down on the ground. Lift the pail off. A gentle tap on the top of the pail will release the sand more easily. |

RESULT: Describe exactly what happened to the sand in each pail.

CONCLUSION: From what you have done and seen, tell what you think makes the sand particles stick together?

1.

Perhaps you found that pressure on the sand made it stick together. What do you think makes sand, gravel, soil and pebbles, stick together to make sedimentary rock?

2.

Where do you think the pressure comes from to make the materials stick together?

3.

SEND FOR CORRECTION

## FIFTH DAY

Concepts in Science 5, pages 11 - 16

By reading sedimentary rocks, scientists can often tell much about what kind of plants or animals lived many thousands of years ago. What they are really reading is fossils. By reading pages 14 and 16 you will find out what fossils are.

1. What are fossils?

2. How are they formed?

We know that fossils are found between the layers of sedimentary rock under the water. However, fossils are found and studied in sedimentary rock, above the water. How do you think this is possible?

Read Concepts in Science 5, pages 11 - 14. Do the questions Before You Go On, page 16.

A. 1. _____

2. _____

3. _____

4. _____

B. _____

SEND FOR CORRECTION

Something for You to Do

1. Your book tells you of one kind of fossil called Imprints. There is still another kind of fossil called Petrification. An example is petrified wood. Do some research on your own and find how this kind is made. Some people collect petrified wood as a hobby.

2. The Badlands are considered a good area for finding fossils. Suggest a reason for fossils being easy to find in this area. Remember your work on the Hoodoos.

3. The Badland areas around Drumheller can be visited. If possible, take a trip with your parents to see them first hand. Perhaps you will find some fossils.

# ANSWERS FOR LESSON 2

Pages 1, 2

1. As the water was stirred, it moved faster and picked up the grains of sand.

2. When the stirring stopped, the water slowed down.

3. As the water slowed down, the sand fell to the bottom.

Conclusion: The faster the water moved, the more sand it picked up and carried.

Faster moving water can carry more material than slower moving water.

Pages 3, 4

1. Yes

2. No. Rocks settled out first, then gravel, then pebbles and finally sand.

Conclusion: Yes. Yes.

Page 7

Result: You should have noticed that the sand in the packed pail stayed in the shape of the pail while the sand in the other pail slumped and began to break apart.

Conclusion:
1. Pressure makes the sand particles stick together.
2. Pressure makes sand, gravel, soil and pebbles stick together to make rock.
3. The pressure comes from the weight of other materials (rocks, sand, soil, water, etc.) on top of the layers of material.

**LESSON RECORD FORM**

**0504 Science**
Unit I

Revised 03/91

Parent's or Supervisor's Comments:

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Assigned
Teacher: _____

Assignment
Code: _____

Graded by: _____

Lesson Grading
Science: _____
Health: _____
Neatness: _____

Date Lesson Received:

_____

Lesson Recorded: _____

_____
Signature

**For Student Use**

(If label is missing or incorrect)

File Number:

_____

Lesson Number: _____

Date Lesson Submitted:

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Grading Scale:

A - Very Satisfactory
B - Satisfactory
C - Weak
D - Unsatisfactory

**Apply Lesson Label Here**

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*Please verify that preprinted label is for correct course and lesson.*

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Signature

Keep this sheet when returned - it is your report.

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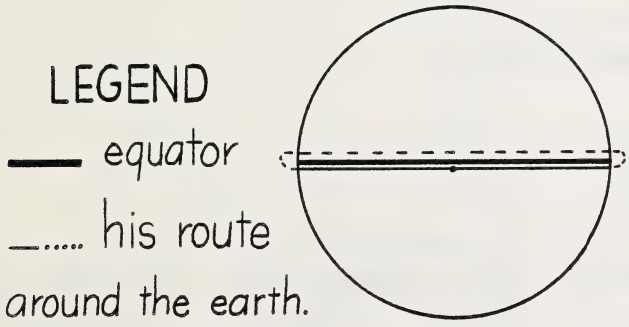
St. Serv. 9-91

# FIRST DAY

For the past two lessons, two boys and you, have been discussing and investigating the changes that occur on the surface of the Earth. You have seen how weathering changes the Earth's surface by wearing land down. Land is built up again as rivers deposit the materials they pick up. You have seen how sediments laid down are pressed into sedimentary rock.

The two boys began thinking more and more about our Earth. They decided they would both take a trip. One boy wanted to travel around the Earth starting from some point on the equator. He wanted to see more changes on Earth.

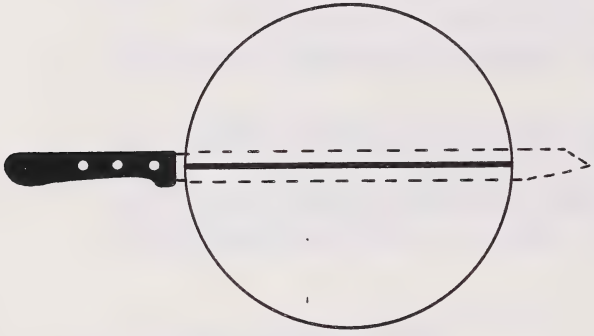



This boy would be traveling around the circumference of the Earth. The circumference is the distance around the middle of the Earth (the widest part of the Earth). The distance is 40 000 kilometres.

Take an orange or grapefruit from your fridge. Pick out a point in the middle of the orange. Trace around the orange, with your finger, until you come to your starting point. You have gone around the circumference of the orange – the widest part of the orange.

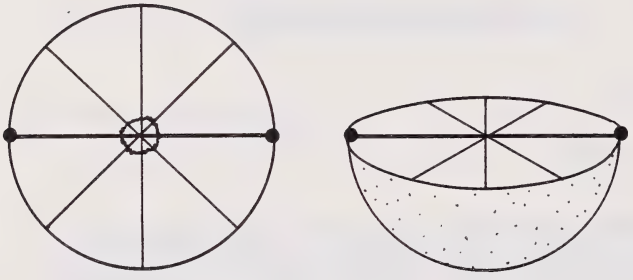
The other fellow wanted to see what the inside of the Earth is like. He wanted to start from a point on the equator and go straight through the Earth to the other side. He would be traveling the diameter of the Earth, which is 12 800 kilometres.

To help you understand what diameter is, put a knife through the middle of your orange. Make it come out the opposite side. Be sure not to slant your knife.



The part of the orange marked with a solid straight line is the diameter of the orange.

Now cut the orange in half.



The solid line is the diameter of the orange.

Cut out the centimetre ruler on page 3.

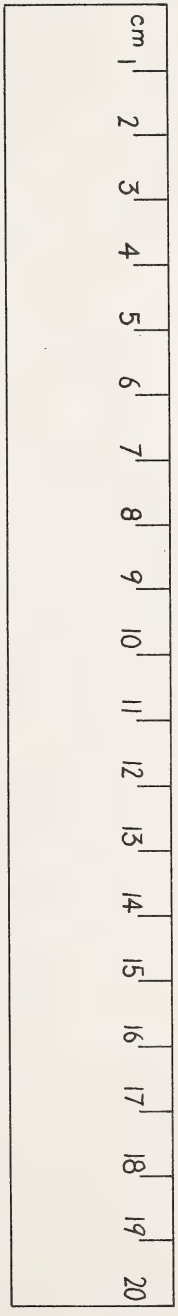
Measure the diameter of your orange. It is _____ centimetres. The Earth's diameter is 12 800 kilometres.

Do you see that going through the Earth is different from going around it?

1. Which boy do you think will reach his destination first?

_____

Check your work with the answers at the end of Lesson 2.




Be sure to keep this centimetre ruler for use later on.

## SECOND DAY

Last day we left the two boys just when they were about to start on their trip. Let's follow the second boy as he goes through the Earth. What is the inside of the Earth like? Yesterday you cut your orange in half. What would we find if we cut the Earth in half?

Scientists talk of three different parts:

1. crust
2. mantle
3. core

Use the colored paper that follows to make a model of these different parts of the Earth's inside.

Use this scale for your model.

1 centimetre (cm) = 640 kilometres (km). This means that 1 centimetre on your model represents 640 kilometres on the Earth's diameter.

PROCEDURE:

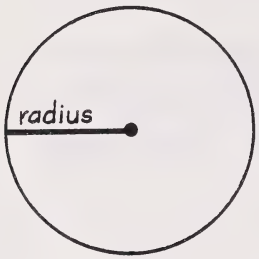
1. Cut the circle printed on the yellow paper. (This circle represents our Earth cut in half.)

   Measure the diameter of the circle.
   Diameter = _____ centimetres.
   Using our scale of 1 cm = 640 km
   what is the diameter of our Earth?
   Diameter of Earth = _____
   kilometres.

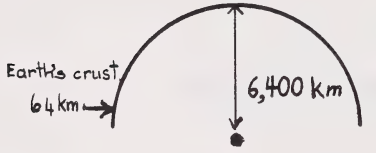
   Measure the radius of the yellow circle.

   How many centimetres is 6 400 kilometres, on the yellow circle?

   _____ centimetres.




Earth cut in half




2. The average (usual) thickness of the Earth's crust is from 16 - 40 kilometres thick. The crust can be from 16 - 40 kilometres thick under the mountains. The thickest part of the Earth's crust is 64 kilometres.

   Let's compare the thickest part of the Earth's crust (64 kilometres) to the radius of the Earth (6 400 kilometres).

   $$\frac{\text{Earth's crust}}{\text{Earth's radius}} \quad \frac{64}{6\ 400} = \frac{1}{100}$$

   If the boy travels through the crust of the Earth, he has gone only 1/100 of the distance to the centre of the Earth.

   Mark the thickness of the Earth's crust by drawing a very thin line around the outer edge of the 20 centimetre circle. This is the crust of our Earth, where our homes, buildings, lakes and mountains are. Looking at it this way, even the tallest mountain seems small, doesn't it!

3. Cut out the circle from the orange-colored paper. What is the diameter of this circle? _____ centimetres.

   Paste this circle in the middle of the yellow circle. The orange circle is the Earth's core.

   How many kilometres is the Earth's core? Remember:

   1 cm = 640 km, so 8 centimetres equal _____ kilometres. The Earth's core is about 5 120 kilometres in diameter.

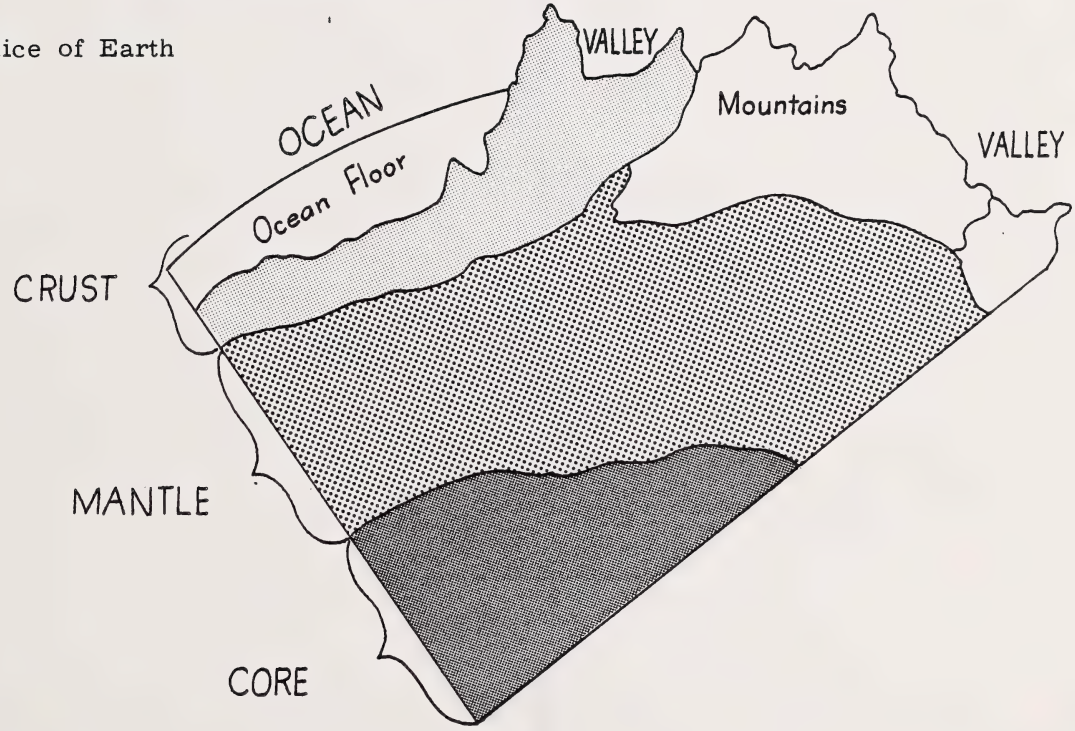
4. The area between the core and the crust is called the mantle. Mark CORE and MANTLE on the model.

You have made a paper model of the inside of our Earth. This is what the second boy must go through to reach the opposite side of the Earth – 12 800 kilometres.

The first boy is going around the Earth. Who will be first to reach his destination? Tomorrow we will find some new things about the inside of our Earth. This new information may help us decide who will win.

If you could slice a part of the Earth it would look similar to the illustration below.

Slice of Earth




Study the illustration. Underline the correct answer.

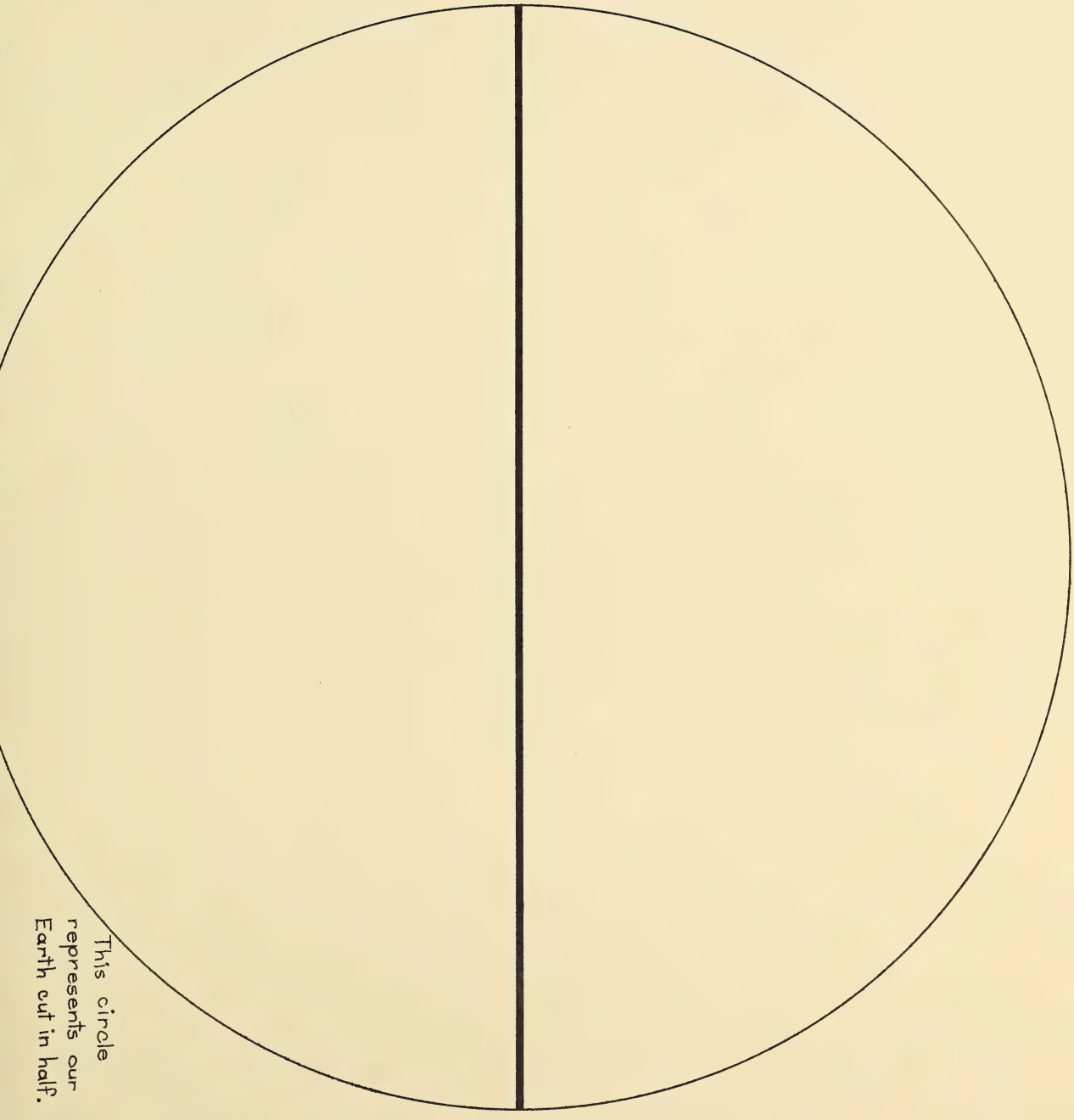
The Earth's crust is thinner: under the ocean

on land

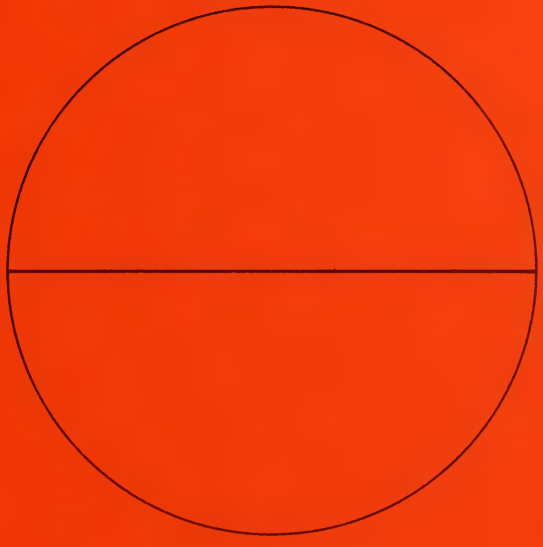
Check your answer.

You should have underlined – <u>under the ocean</u>.

Cut out the circle.



This circle represents our Earth cut in half.



## THIRD DAY

What is the inside of the Earth like? What is it made of? Is it solid? Write any ideas you have about what the inside of the Earth looks like.

An orange will again serve as a good model to help us understand what the Earth is like inside.

PROBLEM: To understand better what the Earth is like inside

MATERIALS: Orange (or grapefruit)

PROCEDURES: Squeeze the orange hard with your hand. Continue to do this until the inside feels fairly soft.

RESULT: The core of the Earth is much like the inside of the orange now. With a little bit of pressure the inside moves around now.

When a pressure is applied to the Earth's crust (as to the orange), the mantle and the core will move around. The core is soft and hot. It is called liquid or MOLTEN rock. The mantle is more solid than the core, but still it has soft melted rock. The crust is solid.

CONCLUSION: After studying our Earth's interior, which boy do you think will finally reach his destination first? Why?

_____

_____

_____

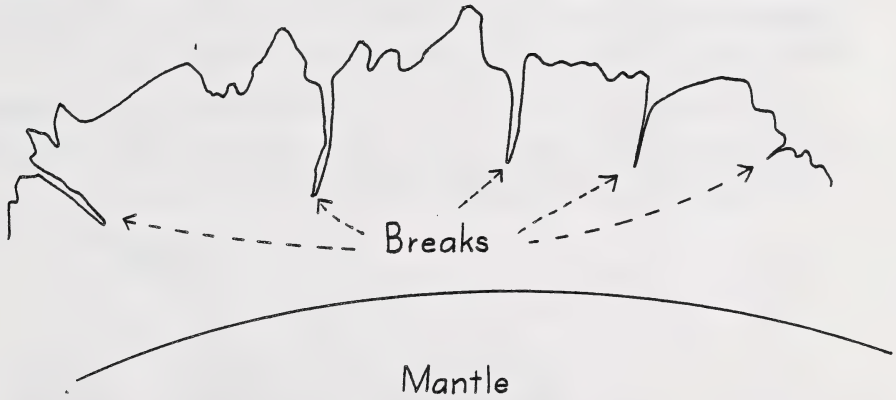
_____

I hope you said the boy going around the Earth would reach his destination first. In fact it is presently impossible to go through the Earth. No one has seen the deep inside. How do we know, then, what the Earth is like on the inside? Next day we will start to find answers to this question.

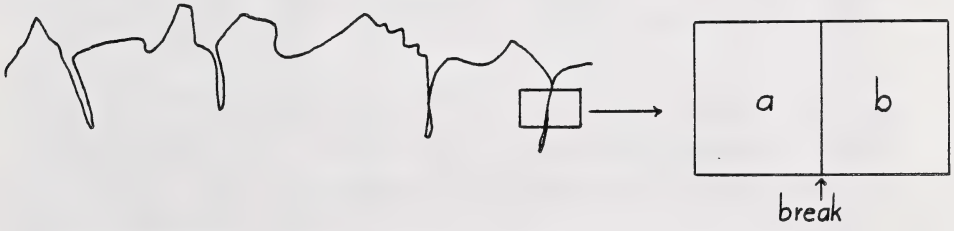
## FOURTH DAY

In yesterday's lesson we saw that the core of the Earth is very hot rock. In fact it is so hot and soft it is called liquid or molten rock. The mantle is more solid than the core but still has soft melted rock. The crust is solid.

No one has ever been through to the inside of the Earth. The question now is, how do we know all these things about the inside of the Earth? To begin to answer this question, we must look at what causes an earthquake. We said that the crust on the Earth is solid. There are however, large cracks, breaks or fractures, in the Earth's crust.

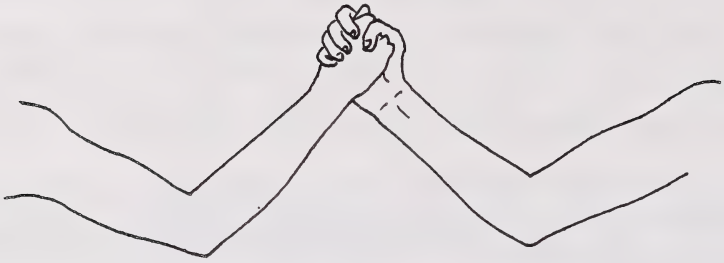



There is a great deal of pressure in the Earth's crust because of the weight of all the overlying materials. Remember, the Earth's crust is 16 - 64 kilometres thick. Let's take two imaginary blocks of rock from the crust.




The pressure of the materials overtop of these two blocks of rock is tremendous. The rocks in such a break are put under great stress and strain. Finally one of the blocks or rocks will "give" or slip under this pressure. To help you understand the ideas of stress and strain, have an arm wrestle with your supervisor or a friend.

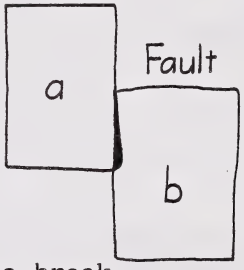
Applied Pressure



Arms begin to feel strained.
Feel the tension in your arms.

Finally you, or your friend, may find that you cannot hold against the pressure of the other. You, or your friend, must give way. The same is true of these rocks.

Even though the Earth's crust is solid, it does shift and move, particularly where there are breaks. When this slip occurs, an earthquake takes place.



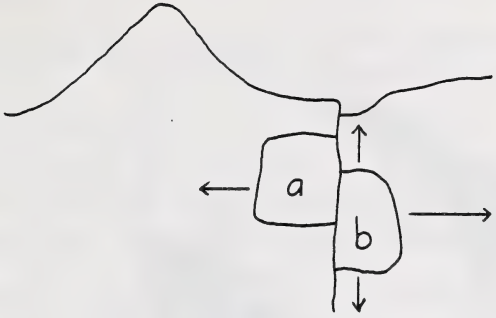

Where there was a break,
we now have a FAULT.

Sometimes the rocks will shift up and down ↕. Other times the rocks will shift sideways ⟷. On page 14 you will find examples of the two ways in which rocks can shift.

When rocks shift we say there has been a release of energy. While the rocks were under great pressure and strain, energy was built up. Energy is the ability to work or the ability to set something in motion.

In a baseball game, if you are full of energy, you can set a ball in motion by throwing it or, you can hit it with a bat.

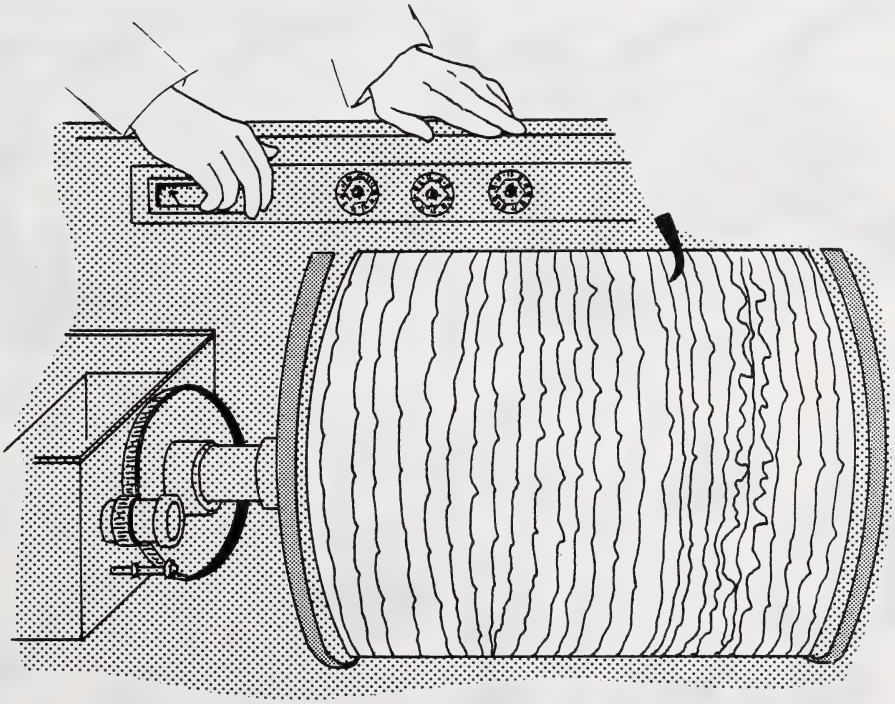
When energy is released in rocks, it sets rocks in motion. The rocks vibrate (shake). This vibration or shaking is passed on to the next rock and so it is carried on.



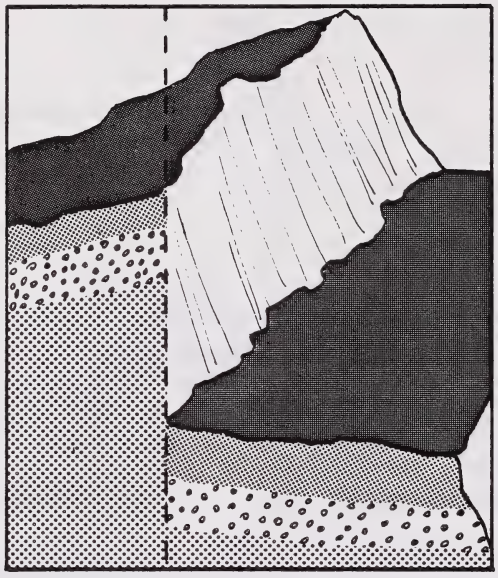

Vibrations are sent out in all directions.

Finally the vibration reaches a station where scientists have an instrument called a seismograph. When the vibration shakes the needle of this instrument, a record is made of the vibration. The pattern that the needle records is called a wave ~~~~~~~~ . We speak of the waves of an earthquake. On page 19 of your text can be found a picture of a seismograph.

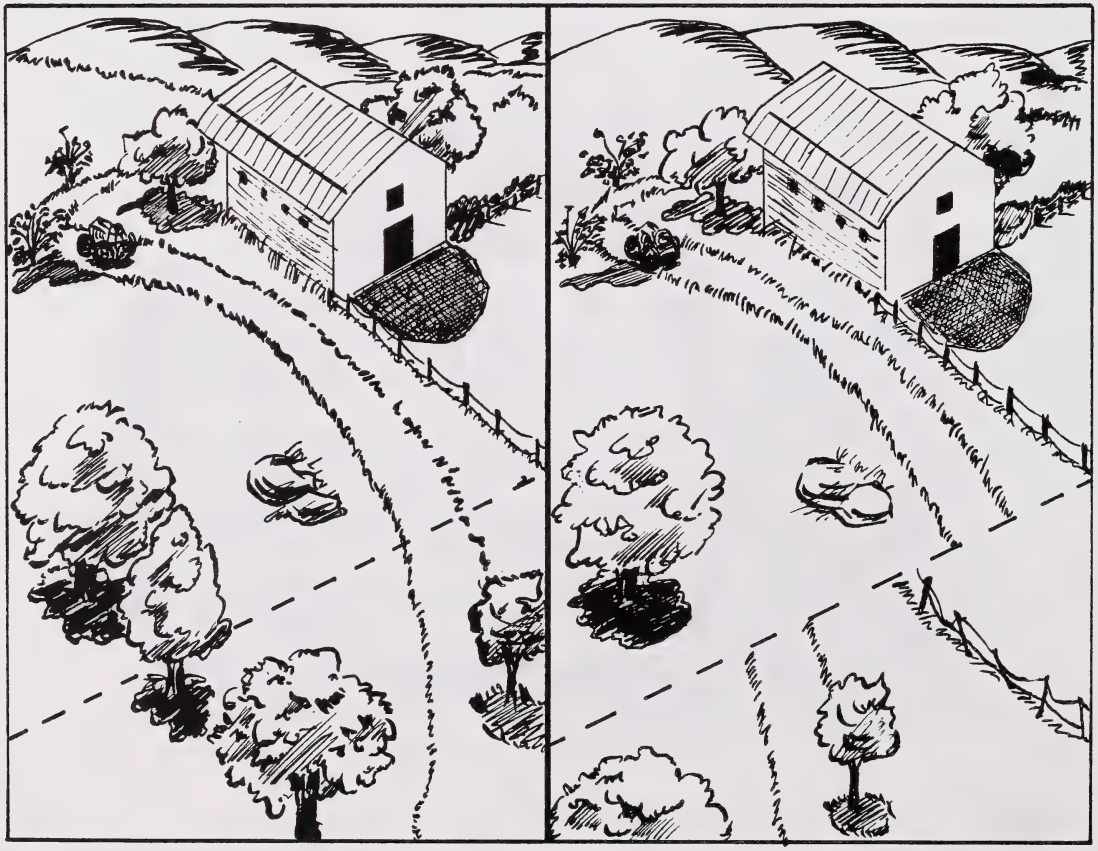
This instrument can record waves of an earthquake that are so light we don't feel them ourselves, but the seismograph does.



Sometimes the rocks slip up and down.



Sometimes the rocks slip sideways.



Concepts in Science 5, page 23

Something for You to Do

Earthquakes can do a lot of damage, as you can see on page 23 of your text. To help you understand how this damage can occur, do the following:

Spread a plastic bag on the bottom of a pan.

Let the mouth of the bag hang over one end.

Cover the bag with damp soil or sand.

Pat the soil smooth.

Set a few objects on the soil to represent buildings and other objects on the Earth's surface.

Inflate the bag and observe the cracks in the surface. Some of the "buildings" will be toppled or shifted in the process.

## FIFTH DAY

Yesterday we talked about shifts in rocks that resulted in earthquakes. To help you understand the shift of rocks in an earthquake use the following:

a pail (or deep sink) and water

PROCEDURE:

1. Fill the pail or sink with sufficient water to submerge your hands and wrists.
2. Imagine that your two hands are 2 blocks of rock from the Earth's crust.
3. Put your palms together. The space between the palms is a "break" in the Earth's crust.
4. Put your hands, palms together, into the water, in the same position as for a dive.
5. Press your hands together as hard as possible. Imagine that there is great pressure on top and on the sides of your hands.
6. Keep pressing your hands together as hard as you possibly can. Then make one hand suddenly slip past the other.
7. Watch what happens to the water when one hand slips past the other.

1. What did happen to the water when one hand suddenly slipped past the other?

_____

_____

_____

_____

_____

_____

2. If you saw ripples, in what direction did they move?

_____

_____

_____

_____

_____

When one pupil did this, he saw ripples of water that spread out in all directions from his hands. These ripples are much like the waves in an earthquake through solid rock.

Yesterday and today we learned about earthquakes. We learned how shaking or vibrating rocks send out waves. However, we still need to answer our first question. How do we know so much about the interior of our Earth when no one has been inside our Earth?

ANSWERS FOR LESSON 3

Page 2

1. If the boy could easily go across the diameter of the Earth he would get to the other side much faster, but, in fact, since he would need to dig his way through, he would be much slower than the boy going around the Earth.

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**0504 Science**
Unit I

Revised 03/91

Parent's or Supervisor's Comments:

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Assigned Teacher: _____

Assignment Code: _____

Graded by: _____

Lesson Grading
Science: _____
Health: _____
Neatness: _____

Date Lesson Received:

_____

Lesson Recorded: _____

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Signature

**For Student Use**

(If label is missing or incorrect)

File Number:

_____

Lesson Number: _____

Date Lesson Submitted:

_____

**Apply Lesson Label Here**

Name _____
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Postal Code _____

*Please verify that preprinted label is for correct course and lesson.*

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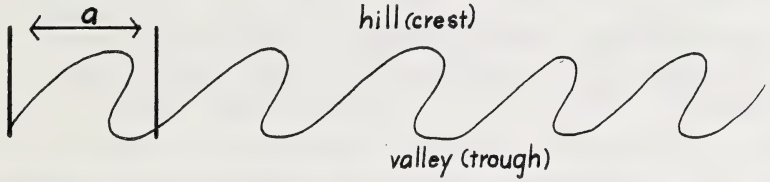
St. Serv. 9-91

FIRST DAY

Concepts in Science 5, pages 23, 24

Last day we discussed how earthquakes occur. We found that when a rock slipped it caused rocks around it to vibrate. We call vibrations like these, waves. These waves travelled through the rocks. A seismograph machine was used to measure and record the waves.

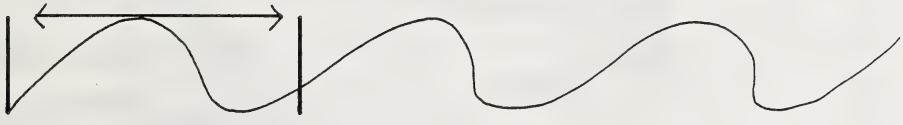
Our first question was to find out how we knew so much about the interior of the Earth. How do we know the core is molten rock? How do we know the mantle is more solid than the core? Scientists have found that different kinds of waves are recorded. Let's look at a wave as it would be, if recorded.




This is one wave. It consists of a trough and crest. Perhaps, valley and hill are easier for you to remember.

Waves can be:

long



short

deep (high hills and deep valleys)

shallow (low hills and not very deep valleys)

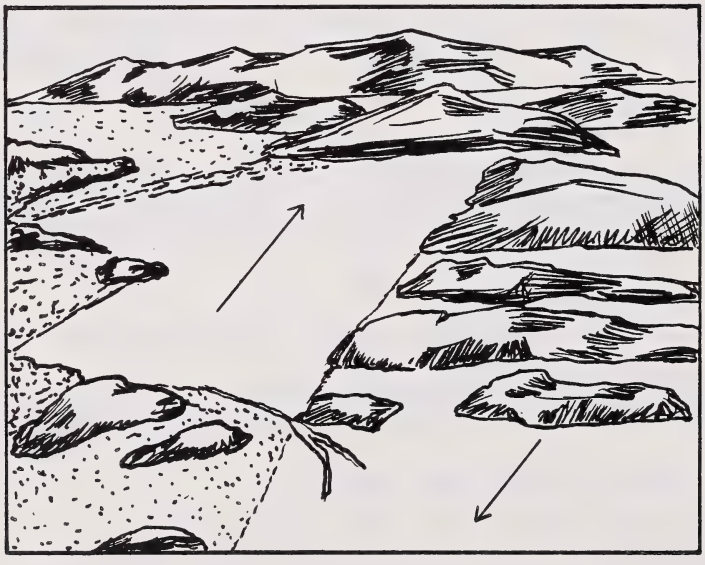
The kind of wave recorded depends on the type of material the wave has gone through.

Scientists have found that when a wave travels through the mantle and core of the Earth it is different from a wave passing through only the mantle or crust. The core, mantle, and crust affect the waves differently. This difference shows on the seismograph record.

By studying the different wave records, scientists can tell:

1. where the wave started,
2. what kind of material it came through, and
3. how long it took to reach the station.

Through this kind of study scientists have charted zones of our Earth, where earthquakes will most likely occur. This can be seen on page 24 of your text. Study the picture. Do you live in an earthquake zone? _____



Branch Fault of San Andreas System

In California, a fault called the San Andreas causes problems. The rocks in this fault periodically slip. Each time they slip, an earth tremor (light earthquake) or quake occurs.

Scientists can measure the stress and strain on rocks in a fault area. From these measurements they often can predict when an earthquake can be expected. Why do you think it is important to be able to predict when an earthquake will occur? The picture on page 23 should help you answer this.

Tell how we know so much about the inside of our Earth. Be sure to write complete sentences.

SEND FOR CORRECTION

## SECOND DAY

Concepts in Science 5, pages 18 - 24

Let's review some of the things we learned from the last lesson by reading pages 18 - 24.

Now do the questions on page 24, Before You Go On.

A. 1. _____

2. _____

3. _____

4. _____

B. _____

SEND FOR CORRECTION

## THIRD DAY

Concepts in Science 5, pages 27-30

For the last few weeks we have been studying these changes on our Earth.

- erosion and weathering of rock
- building of sedimentary rock from sediments dropped into the ocean
- shifting of rock under pressure producing earthquakes

How else may the Earth change? Let's explore further.

I wonder if any of you have seen a volcano in action. Hot molten (melted) rock, called LAVA flows or bursts out of the ground, covering anything in its path. This river of hot molten rock is both a terrific and frightening sight.

From our study on earthquakes we found that energy is the ability to make anything move. To move a baseball your body energy is used. An automobile is started because of the energy of burning gasoline. When a volcano starts up, heat energy is used from the Earth. However, where does the earth get this energy?

Read page 27 - Heat in the Earth, to the bottom of page 28, both columns. Write a paragraph or two describing in your own words, how the earth gets heat energy to melt rocks. Write your paragraphs on the ruled page under the title The Source of Earth's Heat.

Answer the following questions to guide you in writing your paragraphs. Give sentence answers in your paragraphs.

1. What is an atom?
2. What is the center of an atom called?
3. What are the names of the particles inside an atom?
4. Are these particles held together loosely or tightly?
5. When a scientist splits a nucleus this is called _____.
6. When a nucleus is split what is released?
7. What does this energy cause?
8. The natural breaking up of a nucleus of an atom is called _____.
9. Give an example of a substance which is radioactive.
10. Where is uranium found?
11. What often happens to the heat released when a uranium nucleus splits?
12. What happens when the heat from a broken uranium nucleus cannot escape?
13. In a sentence or two conclude your paragraph by telling where the Earth gets most of its heat.

The Source of Earth's Heat

SEND FOR CORRECTION

Now you can answer the four questions on pages 29 and 30.

A. 1. _____

2. _____

3. _____

4. _____

SEND FOR CORRECTION

## FOURTH DAY

Last day we found that the Earth received heat energy when the nucleus of an uranium atom was split up. This heat energy is great enough to melt rocks in the Earth's crust and mantle. These rocks may be part of a volcano. However, we must find out why these melted rocks burst from the Earth in the first place.

To help us answer this, we must remember some facts about molecules:

1. Molecules of substances are always moving.

2. When molecules of a substance are heated they get energy – heat energy. They move much faster when they receive heat energy. They spread out, or expand.

If molecules with heat energy were in some container, but they could not spread out as they needed to, what do you think might happen?

_____

_____

_____

The molecules will strike the walls of the container again and again. Finally, depending on the container, the walls may break or the lid may burst off.

PROBLEM: To find what happens to heated water molecules in a coffee percolator

MATERIALS: A percolator with a glass top, water (and coffee if your supervisor wishes)

PROCEDURE: Set the percolator up for ordinary coffee. Wait until it perks. WATCH THROUGH THE GLASS TOP TO SEE WHAT HAPPENS TO THE WATER.

RESULTS: Describe exactly what you saw happening to the water when it was perking. Did the water burst out of the funnel, or did it come out slowly?

_____

_____

_____

_____

_____

CONCLUSION: What was happening to the speed of the water molecules as they received heat energy?

_____

_____

What do you think was happening inside the pot when the fast-moving molecules needed to spread out?

_____

_____

_____

Where did the molecules of water finally find they could go?

_____

_____

The molecules with the heat energy could not spread out as they needed to. The heated molecules struck the sides of the pot. As the heat energy continued to make the molecules move faster, they struck the pot walls harder and more often. They pressed to get out. When this happens, we say the Pressure is building. Finally the molecules found a way to escape. They burst through the funnel (and coffee). This continued until the supply of heat energy was cut off.

## FIFTH DAY

Concepts in Science 5, pages 25 - 34

Yesterday we started to explore a reason why molten rock bursts out of the ground. We found that when molecules are heated they expand. However, if molecules with heat energy are trapped, great pressure builds up.

What do you think would help trap the heat energy of molten rock? (Think about our work on sedimentary rock to help you answer this question.)

I hope you said that tons and tons of sedimentary rock will trap this heat.

With these things in mind I would like you to give an explanation why molten rock bursts out of the ground in a volcano.

Hot liquid rock may find an opening or weakness in the crust through which it can escape. It will flow over the land around.

However, if the hot liquid rock is under tons of sedimentary rock, heat is trapped. Great amounts of pressure build up until the hot molten rock is forced through the layers of heavy rock. The great pressure from heated molecules of rock make the molten rock burst out of the ground.

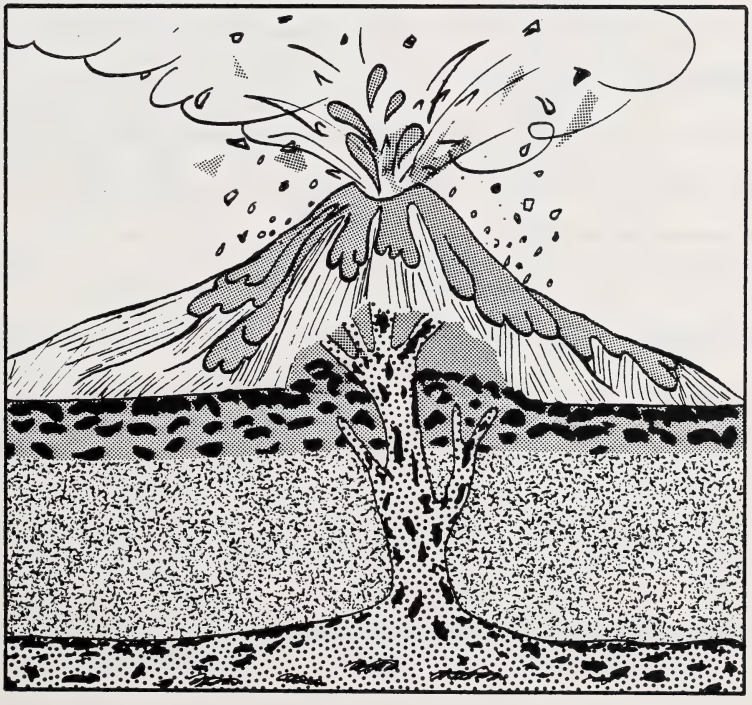
What do you think happens to the molten rock or LAVA when it comes in contact with cool air?

_____

_____

_____

The picture on page 25 will show you what happens. The lava cools and after many eruptions of lava, a volcanic mountain is built.



Knowing how volcanoes are formed, explain how an island in the middle of an ocean might be formed.

Check your ideas with those on page 34 of your text.

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**0504 Science**

Unit I

Revised 03/91

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St. Serv. 9-91

# FIRST DAY

In last day's lesson we saw how one type of mountain was formed – volcanic mountains. Not all mountains are formed this way, since molten rock does not always burst from the Earth. There are several theories (big ideas) on how mountains are formed. Building a model will give us some help.

PROBLEM: To build a model to help us discover a way in which mountains may be formed.

MATERIALS: a balloon, water

PROCEDURE:

1. Fill the balloon full of water.
2. Tie the end of the balloon with a knot.
3. With the palm of one hand, press down one end of the balloon. WATCH TO SEE WHAT HAPPENS TO THE OTHER END OF THE BALLOON.

RESULTS: When you pressed down on the balloon tell exactly what you saw happening to the other end of the balloon.

_____

_____

_____

_____

CONCLUSION: What forced the water to create a bulge in the balloon?

_____

_____

_____

_____

A similar sort of thing might happen in real mountain building. Remembering what happened in this model, I want you to explain a way in which mountains may be built. When explaining, also remember the tons of pressure produced by sedimentary rock. Remember also, that parts of the crust and the mantle are liquid rock.

SEND TODAY'S WORK FOR CORRECTION

## SECOND DAY

Concepts in Science 5, pages 31 - 33

Yesterday you developed a theory about mountain building. This theory was mostly about the PRESSURE of sedimentary rock that forces molten rock to move. However, scientists believe it is more than just pressure on molten rock that makes mountains rise. They believe HEAT is involved.

Where does the Earth get its interior heat from?

Keeping this in mind, how do you think heated molten rock might be used in building mountains?

Read pages 31, 32 and the first column of page 33 to see how your ideas of mountain building compare to that of scientists.

After reading, you should see that the same things are involved in mountain building as in volcanoes erupting — HEAT and PRESSURE.

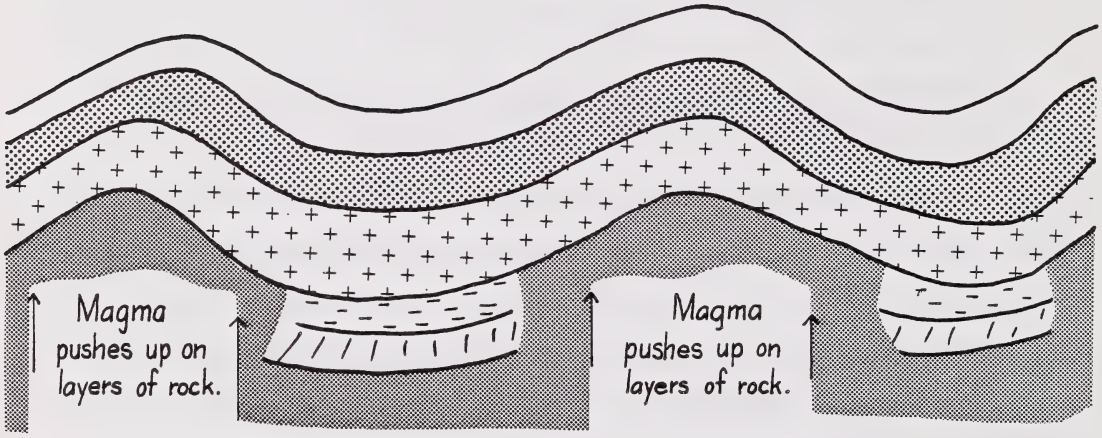
## THIRD DAY

Concepts in Science 5, page 33

Today, let's look at what happens to the rock layers of the crust that are pushed up in mountain building.

When magma (hot molten rock) pushes on the Earth's crust, the crust often bends or folds. The magma pushes the crust upward as in mountain building.

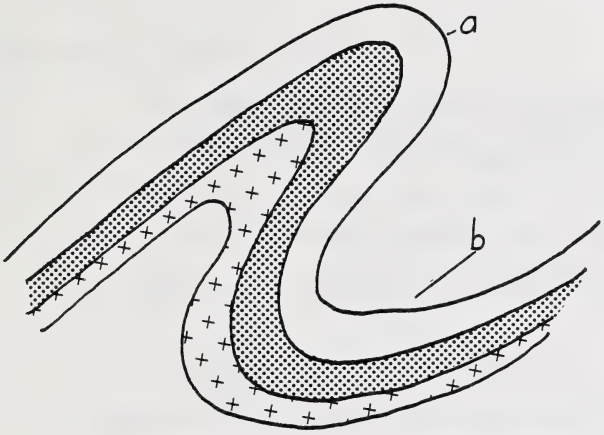
Folds in Earth's Crust




To help you understand this:

1. Place a piece of paper (or more) on a table.
2. Place your hands on the ends of the paper.
3. With your hands still on the paper, press your hands toward each other.
4. The fold in the paper, caused by pressure from your hands, is much like the crustal folds caused by magma pressing upward.

Sometimes magma presses so hard that the fold slants.




a. This fold is called an <u>anticline</u>. It goes uphill.

b. This fold is called a <u>syncline</u>. It goes downhill.

Mountains and hills are basically anticline folds. Valleys are basically syncline folds.

Sometimes when magma pushes on the crust, the crust does not bend or fold. The layers may break. When the layers shift, an earthquake occurs, and a FAULT results in the rock layers. The picture on page 33 shows a fault. The rock layers are not even with each other.

In Lesson 2, Fifth Day we found out what fossils are. We found that fossils <u>are formed</u> in sedimentary rock <u>under water</u>. However, fossils can be found on land, high above water. With what you have learned about the push on the Earth's crust in mountain building, suggest how fossils can be found above water.

Read page 33 to see if you are correct.

## FOURTH DAY

Concepts in Science 5, pages 31 - 34

Today, you may read pages 31 - 34 to refresh your memory on the things we discussed this week. Do the questions Before You Go On, page 34.

A. 1. _____

2. _____

3. _____

4. _____

SEND FOR CORRECTION

## FIFTH DAY

Concepts in Science 5, pages 39, 40

For almost five lessons now we have been exploring the Earth inside and out. We have talked about:

- the hard rock of the crust,
- the molten rock called magma, which makes up a large part of the mantle and core.

We have not taken a really close look at all this rock. I have been told that there are great treasures such as gold, silver, copper, aluminum, and iron in the Earth's rocks. I have invited a friend to tell you all about the different sorts of rocks there are.

Mr. Wilbur Rockhound

"Howdy: I'm a rock hound and I am here to tell you about rocks.

There are three basic kinds of rocks. We can tell which ones are which by the way in which they are formed. You already know about one kind of rock called the SEDIMENTARY ROCK.

Just to refresh your memory, I would like you to tell me just how these rocks are made. Don't forget to mention pressure.

Check Lesson 2 Fourth Day if you are not sure you remember completely."

Sedimentary rock is the name for all the rocks that are formed in this manner.

Here are some examples of sedimentary rocks. Use all the information you can find on pages 39 and 40 under The Look of Sedimentary Rocks, to fill in the chart below.

SEDIMENTARY ROCKS

| | A test to tell what rock it is | What is it made from | A use for it |
|---|---|---|---|
| a. Sandstone | | | |
| | | | |
| b. Shale | | | |
| | | | |
| c. Limestone | | | |
| | | | |
| d. Chalk | | | |
| | | | |

Do you think these rocks would wear down slowly or quickly? Why?

_____

_____

_____

_____

_____

Check your work with the answers at the end of Lesson 5.

Next day we will talk about sedimentary rocks that are changed.

ANSWERS FOR LESSON 5

Page 8

| | A test to tell what rock it is | What is it made from | A use for it |
|---|---|---|---|
| a. Sandstone | - can be broken easily<br>- looks like sand | - sand | - old brownstone houses |
| b. Shale | - smells like clay or mud | - pressed mud or clay | - stone walls<br>- flagstones |
| c. Limestone | - will bubble if placed in vinegar | - calcium carbonate | - building |
| d. Chalk | - white in color<br>- will bubble if placed in vinegar | - shells of tiny animals | - cement |

These rocks wear down quickly because they are soft rocks.

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Unit I

Revised 03/91

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St. Serv. 9-91

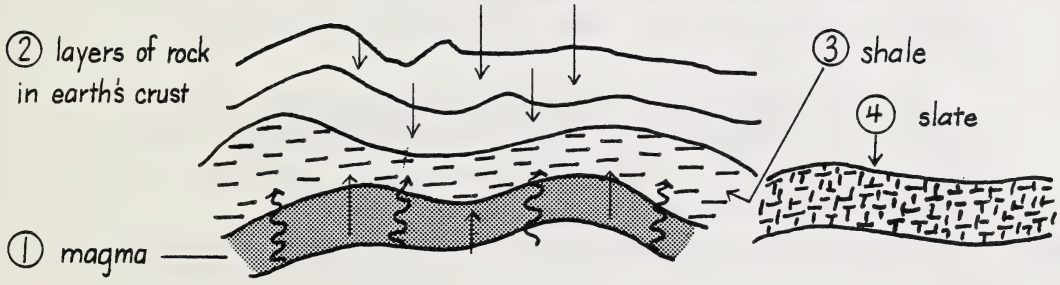
FIRST DAY

Concepts in Science 5, pages 40, 356

Last day we reviewed how one type of rock is formed. We found several examples of sedimentary rock as shale, chalk, limestone and sandstone. Today Wilbur Rockhound will go on to tell us about other rock types.

"We learned that shale is a sedimentary rock made from pressed mud. Slate is an example of another kind of rock, called METAMORPHIC rock. Slate is made from shale. How is this possible?"

Shale Turns into Slate




1. Magma pushed upward (↑) against the overlying rocks. This molten rock, magma, also heats up the rock above it.

2. Rock layers press downward with great pressure.

3. Shale is caught between. The tremendous pressures and heat change shale into:

4. Slate. Blackboards are made of slate. Slate is changed rock – metamorphic rock.

A very beautiful rock called marble, is also a changed or metamorphic rock. Let's do some detective work. Let's find out what sedimentary rock marble is made from.

Clue: When vinegar is poured on marble, bubbles appear. What sedimentary rock do we know of that will bubble when vinegar is poured on it?

What sedimentary rock do you think marble is made from?

_____

Why do you think this?

_____

_____

_____

_____

_____

The bubbles indicate the presence of _____ _____ in limestone and marble. Page 40 of your text will tell you if you are correct.

Under heat and pressure limestone is changed into marble. Marble is another example of the rock type called metamorphic – rock changed in form. See page 356 for a good example of metamorphic rocks.

Check your answers with those at the end of Lesson 6.

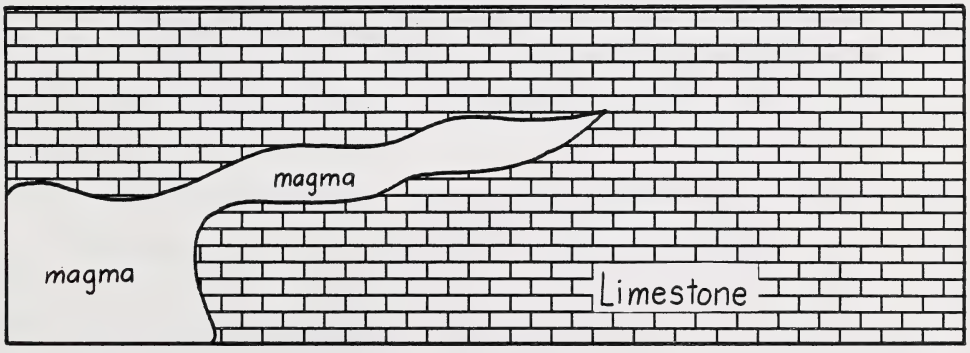
## SECOND DAY

There is still a third kind of rock we have to discuss. We started our discussion on rocks by talking about great treasures. These treasures are minerals. Minerals are substances made from elements and compounds. Minerals are called great treasures because of their wide use in our world, from medicine and industry to making beautiful jewellery. They are extremely valuable to us. Gold, silver and salt are examples of minerals. What do minerals have to do with the third kind of rock? I'll let Wilbur Rockhound tell you more.

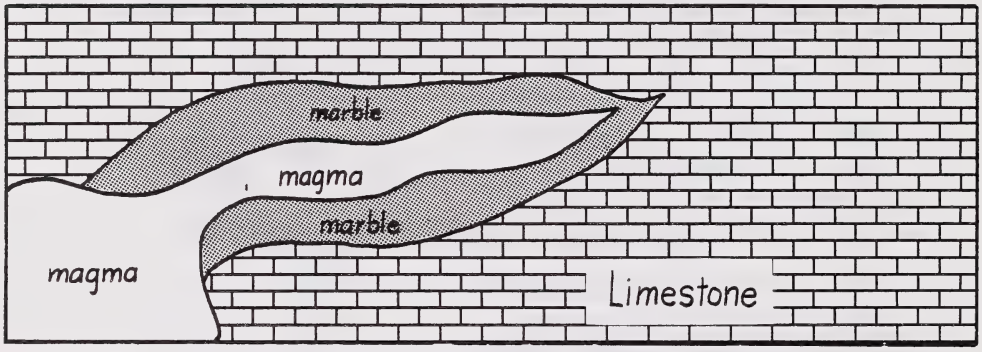
"Minerals are found in the crust, magma, mantle and the core. We know that some magma reaches the surface through volcanoes.

However, not all magma in Earth's crust reaches the surface. Some magma cools and hardens below the surface to form rock."

In the following, magma forces its way into and then along a crack between two layers of limestone.



The limestone layers are heated by the hot magma. Limestone changes into marble. The magma cools and hardens.




Any rock formed from fire-hot magma is called IGNEOUS rock. An example of igneous rock is granite which is the most abundant rock in the mountains.

Next day we will find out how igneous rocks are connected with minerals.

## THIRD DAY

Concepts in Science 5, pages 37, 347

"Last day we found how igneous rocks are formed. Now if you remember, I told you minerals such as gold, silver and salt are found in magma that is cooled, above or below the earth's surface. Therefore igneous rocks contain minerals. Granite, an igneous rock, contains the minerals, feldspar and quartz."

On page 37 of your text are examples of igneous rocks all made from magma containing minerals. Why do these igneous rocks all look so different though? On page 37 you will find three reasons why igneous rocks can look so different.

1. _____

_____

_____

_____

2. _____

_____

_____

_____

3. _____

_____

_____

_____

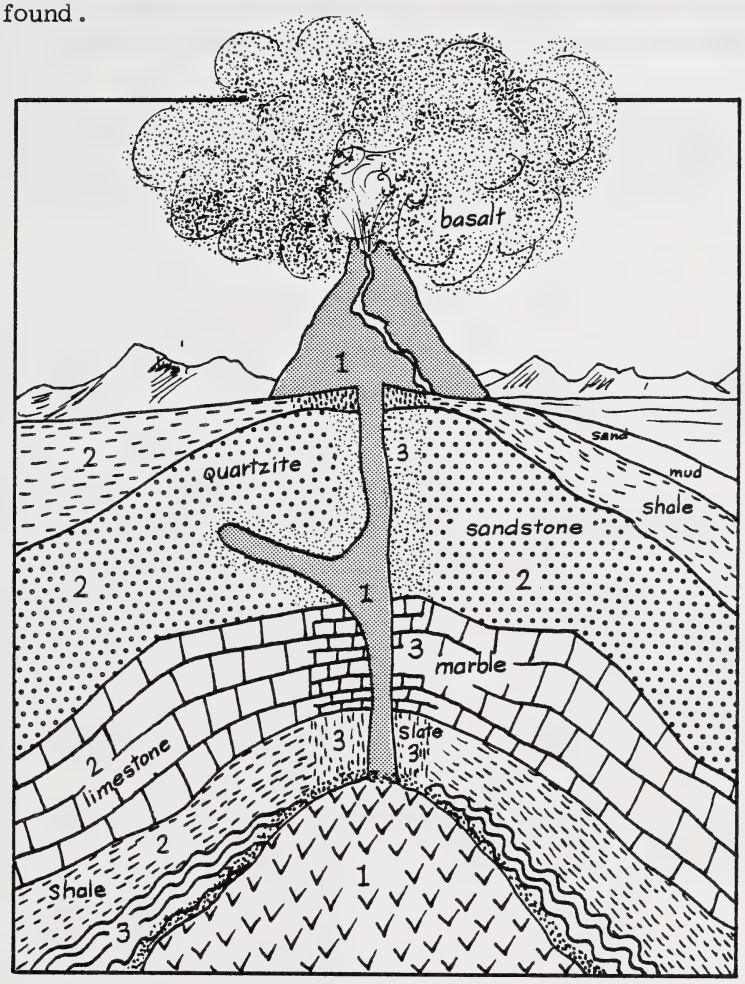
Check your work with the answers at the end of Lesson 6.

For more examples of igneous rocks turn to page 347 of your text.

"I must leave you now.
I am going on an expedition
with my master, a geologist.
I hope you have enjoyed this
brief study of Earth's rocks."

## FOURTH DAY

We have studied three kinds of rocks. Let's take a look at our Earth's crust to see where these types might be found.




1. Rocks formed by high temperatures or from molten lava are called IGNEOUS rocks.

2. Sediment that gathers at the bottom of bodies of water forms SEDIMENTARY rocks.

3. Any rocks changed by heat, pressure or chemicals are called METAMORPHIC rocks.

Something for You to Do

1. On page 38 of your text is an investigation into the form of crystals. If you decide to try to do this experiment, be sure to tell me of the results. It may take several days for the crystals to form.

2. Rock collecting is a very interesting hobby. Perhaps you would like to start it as your hobby. There are inexpensive booklets on rocks available in stores such as Coles books.

## FIFTH DAY

Concepts in Science 5, pages 42, 43

Have you ever heard of trees made of stone? On page 42 of your text you may read about a forest with trees made of stone.

What is the meaning of the word petrified?

_____

_____

_____

_____

_____

Complete the questions on page 43 - Before You Go On.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

SEND FOR CORRECTION

# ANSWERS FOR LESSON 6

Page 2

Marble is made from limestone.

When chips of marble are placed in vinegar, the vinegar will bubble because carbon dioxide is being produced. This is the clue that marble is made of calcium carbonate.

The bubbles indicate the presence of calcium carbonate in limestone and marble.

Page 5

1. Different rocks have different minerals in them.
2. Two rocks may have different amounts of the same mineral.
3. Some of the minerals in a rock may be in the form of crystals.

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# FIRST DAY

In these review questions you may go back if you need to, to check on some of the things you may have forgotten.

For the past six weeks we have explored changes inside and and on the surface of our Earth We have seen that even though some changes are very slow and almost unnoticeable at first, change is still going on every second of every day. Changes produced by weathering agents are often slow and unnoticed unless we watch for them. Earthquakes and erupting volcanoes are changes that we notice more readily.

Our Earth is in a constant state of change. In this change, land is worn down and land is built up.

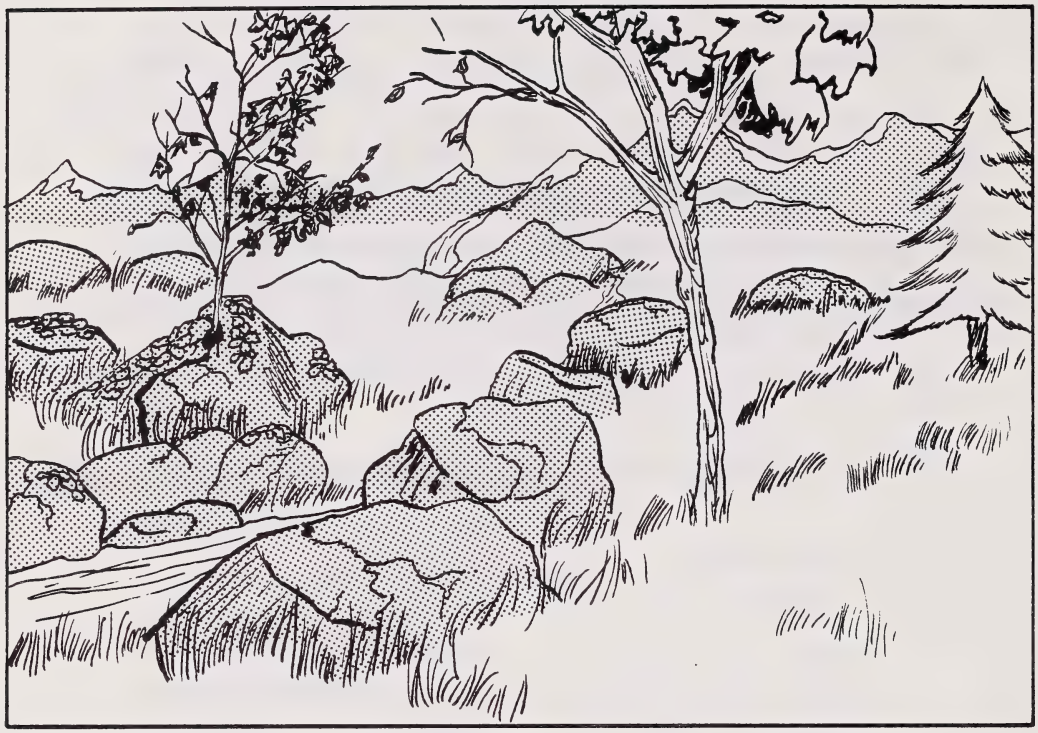
Fill in the following blanks with the correct words.

| | |
|---|---|
| worn down | plants |
| changed | weathering agents |
| ice | soil |
| wind | Earth |
| water | place |
| sun | |

1. In Lesson 1, we discussed ways in which our Earth is _____ _____ and _____.

_____, _____, _____, _____ and _____ help wear down our Earth. They are called _____ _____. These agents work at wearing down our _____ and in doing so, _____ is formed or moved from one _____ to another.

2.



Name the weathering agents that might be at work in this picture. Tell of places where you see weathering agents have been working and could still be at work.

| | | |
|---|---|---|
| molecules | larger | scraping |
| expand | wear | debris |
| cracks | glaciers | moves |

3. Water often lies in the _____ of rocks. When _____ of water freeze, they _____. When the molecules of ice expand, the crack in the rock is made _____. In this way ice helps _____ down the Earth.

Great rivers of ice called _____ change the Earth's surface by _____ it with boulders and other _____ it carries as it _____.

4. Summertime

Winter passes

Next summer

What has happened to the pot during the winter?

(a) _____

_____

Suggest a reason or two for this to happen.

(b) _____

_____

_____

_____

_____

_____

(c) What may eventually happen to the pot?

_____

_____

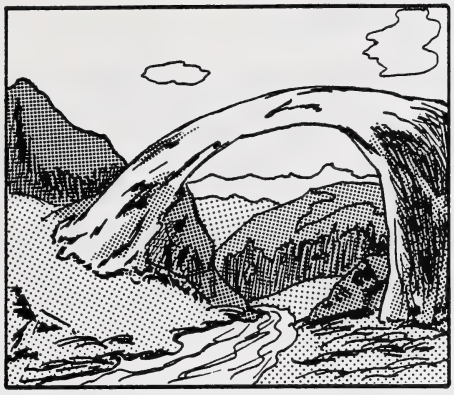
_____

_____

Use the following words correctly in exercise 5 below.

| | | |
|---|---|---|
| packed | rain | odd |
| tightly | loose | rain |
| loosely | standing | Hoodoos |
| wind | wind | Drumheller |
| loosely | | |

5. Some soil is (a) _____ together (b) _____.
Other soil is packed together (c) _____.
(d) _____ blows away (e) _____ packed soil.
This may leave the tightly packed soil standing in
(f) _____ shapes.
Water in the form of (g) _____, will also wash
away (h) _____ soil leaving the packed soil
(i) _____ in odd shapes.
Together the (j) _____ and (k) _____
produce the odd shapes called (l) _____ seen
in (m) _____ Alberta.



6. Here is a natural archway of limestone. What weathering agents were at work to produce this archway of stone?

_____

_____

_____

_____

_____

_____

heats molecules

7. When the sun (a) _____ a substance such as a rock, the rock's (b) _____ expand.

8. Here is a piece of highway with big bumps in it. What weathering agent may have been at work here?

(a) _____

How did this agent cause these bumps?

(b) _____

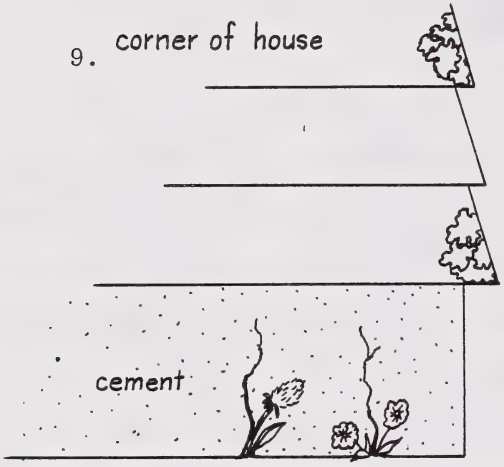
_____

_____

_____

_____

9. corner of house




Here is the corner of an old house. Little lichens are growing on the corners. In the cracks in the cement, plants are growing. What effect will these plants have on this house?

_____

_____

_____

_____

_____

_____

_____

_____

Check today's work with the answers at the end of Lesson 7.

## SECOND DAY

In Lesson 2 we found what happens to the materials that weathering agents have broken down. Water is the main transport system that carries materials of all sizes toward the ocean or lakes.

We learned that the amount of material being carried depends upon:

1. _____

2. _____

1. In the following, tell which river is flowing faster, river A or river B. Explain why you answered as you did.

   River A has carried materials to the ocean. It has dropped sand, rocks and pebbles.

   River B has carried some sand. The sand was deposited at the mouth of the river (where the river runs into the ocean).

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. Join the next two rivers with the correct ending.

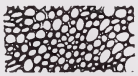
   a. A slow, winding river carries

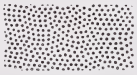
   b. A rushing river carries

_____ a lot of sand, pebbles and rocks.

_____ some sand or fine materials.

3. When a river finally reaches a lake, ocean or place where it slows down, the materials it carries are dropped. All materials do not settle at the same time. Below are different sizes of materials. In the blanks below, tell which of these materials will settle first, second, third and fourth.

pebbles  _____

sand  _____

gravel _____

soil _____

4. These materials which are dropped become sedimentary rock. What causes these materials to stick together to become rocks?

_____

_____

_____

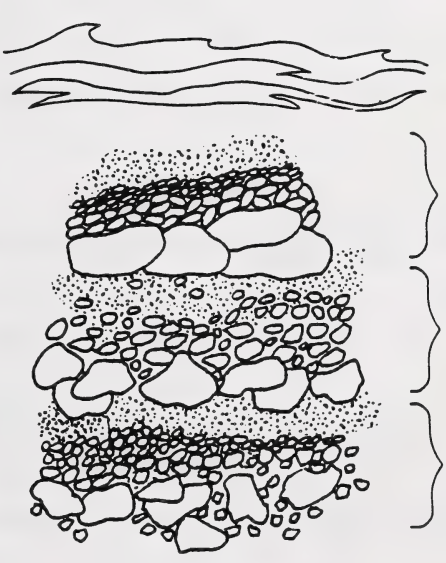
_____

_____

In one year a river has carried some large rocks, some pebbles and some sand. Each of these materials settles down: large pieces settle first and then smaller pieces of material. This makes one year of settling.

The next year, the same river again carries large rocks, some pebbles and some sand. Each of these materials settle down on top of the materials from the year before. This process continues from year to year.

Pictured below is the way in which the materials settle on top of each other year after year.




Draw a line to the group of rocks, pebbles and sand which settled first.

This is the oldest section of materials.

Draw a line to the group of rocks and pebbles and sand which have settled last.

This is the youngest section of materials.

Explain why you answered as you did.

_____

_____

_____

_____

## THIRD DAY

In Lesson 3 we followed the travels of a boy who wanted to go through the Earth. We found what our Earth is like on the inside.

1. In the space below:

   A. Draw and mark three parts of the Earth we talk about.

   B. Tell something you learned about each of the three parts.

      a. _____

      b. _____

      c. _____

2. In the following, fill in the blanks with the correct words from this list:

| | |
|---|---|
| breaks | release energy |
| pressure | vibrating |
| stress | seismograph |
| strain | wave |
| slip | |

In the Earth's crust, cracks or _____ can be found. The crust is under great _____ from overlying material. This builds up _____ and _____ in the rocks, especially where there is a break. Finally the rocks in the break area will _____ and _____ _____.

This energy starts the rocks shaking or _____.

The vibration is passed from rock to rock until a

_____ records the vibration. The record

of the vibration is called a _____.

3. Explain in your own words how earthquake waves tell us about the inside of our Earth.

_____

_____

_____

_____

_____

_____

_____

_____

_____

4. The Tames family bought a house in an earthquake zone. They wanted to buy insurance for their house. They found they paid much more for insurance when living in this earthquake zone. Can you explain why?

_____

_____

_____

_____

_____

_____

_____

_____

_____

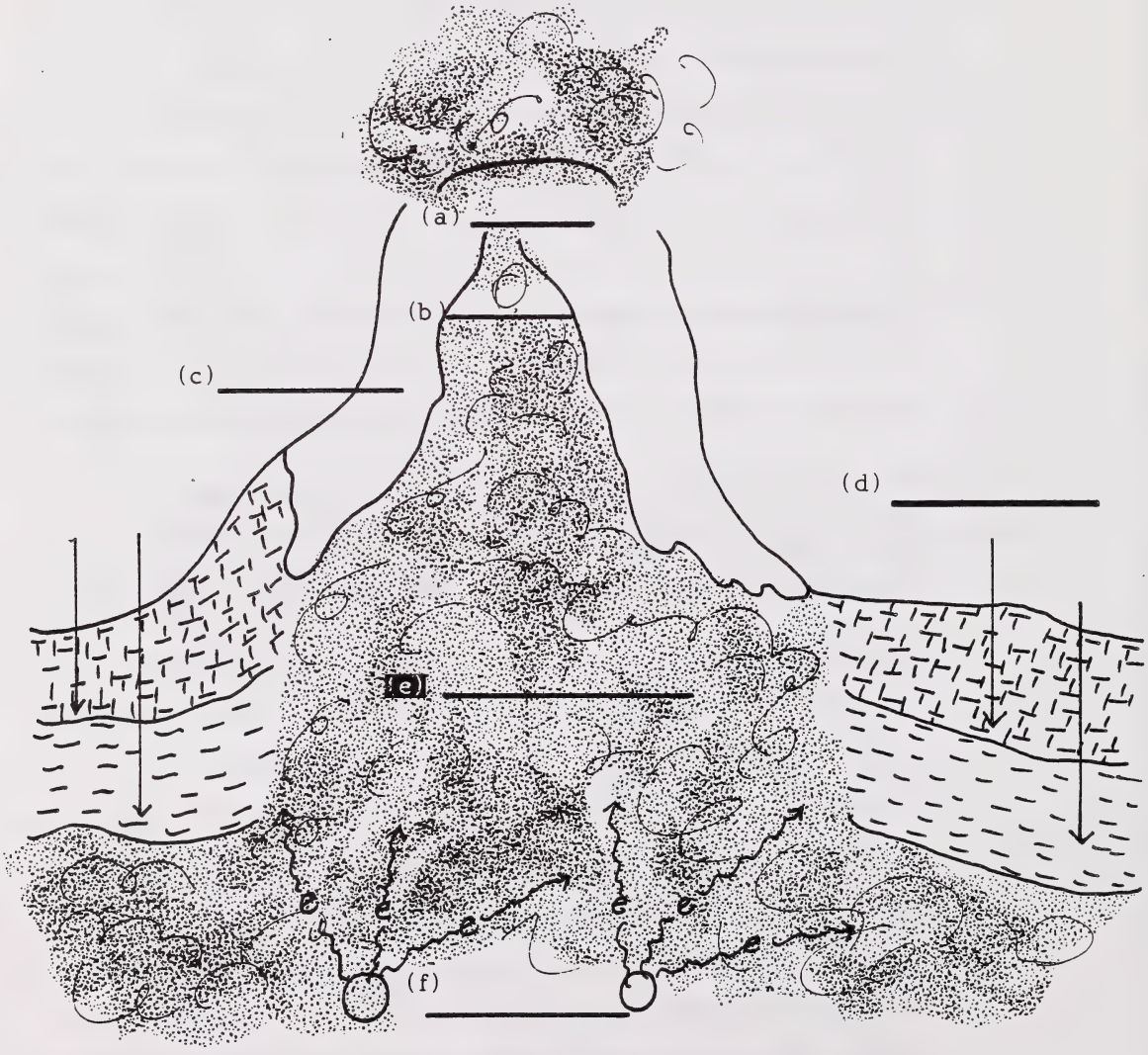
_____

SEND FOR CORRECTION

## FOURTH DAY

In Lesson 4 we learned about the Earth's source of heat energy. We went on to see how this heat energy contributes to mountain building.

In the diagram below are a number of blanks. On the next page are various numbered explanations of what is happening in the diagram. Put the correct number in the right blanks in the diagram.




Check your answers with the ones at the end of Lesson 7.

1. Uranium atoms split up to release energy.

2. Heat energy from split uranium atoms heats up molecules of rock, in mantle. Heated molecules expand and try to spread out.

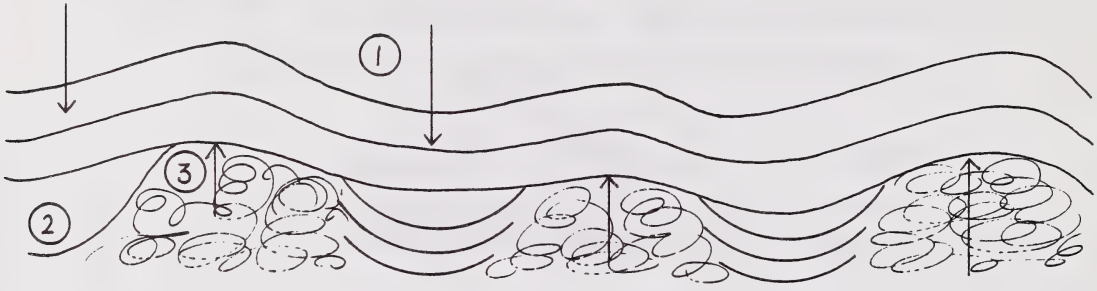
3. Tons of sedimentary rock press downward trapping the heat released from uranium atoms.

4. When heated molecules of rock are trapped, pressure builds up, until finally the hot molten rock finds a way to escape.

5. The molten rock called lava bursts from the top of the volcano and slides down the side.

6. Gradually the lava cools and hardens to become part of the volcanic mountain.

Volcanic mountains are just one way in which mountains are built. However, similar forces are at work in other kinds of mountain building. Explain what is happening at each of the points below.




1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

When magma pushes rocks up to form mountains we say the rock is folded. A geologist calls the folds of mountains and valleys anticlines and synclines.

Mountains can be called syncline folds.

4. Therefore, valleys are called _____ folds.

Check your work with the answers at the end of Lesson 7.

## FIFTH DAY

On the following page is a crossword puzzle. Use these clues to fill in the puzzle.

Down

1. _____ rocks are made from cooled magma.

4. _____ and 5. _____ change sedimentary rock into metamorphic rock.

6. An example of sedimentary rock being changed into metamorphic rock is shale changed into _____.

9. An example of sedimentary rock is _____.

11. Igneous rocks contain great treasures which we use in our everyday world. These treasures are _____.

12. The _____ of tons of materials on top of sediments, presses sediments together to form rock.

Across

2. _____ which has cooled forms a kind of rock.

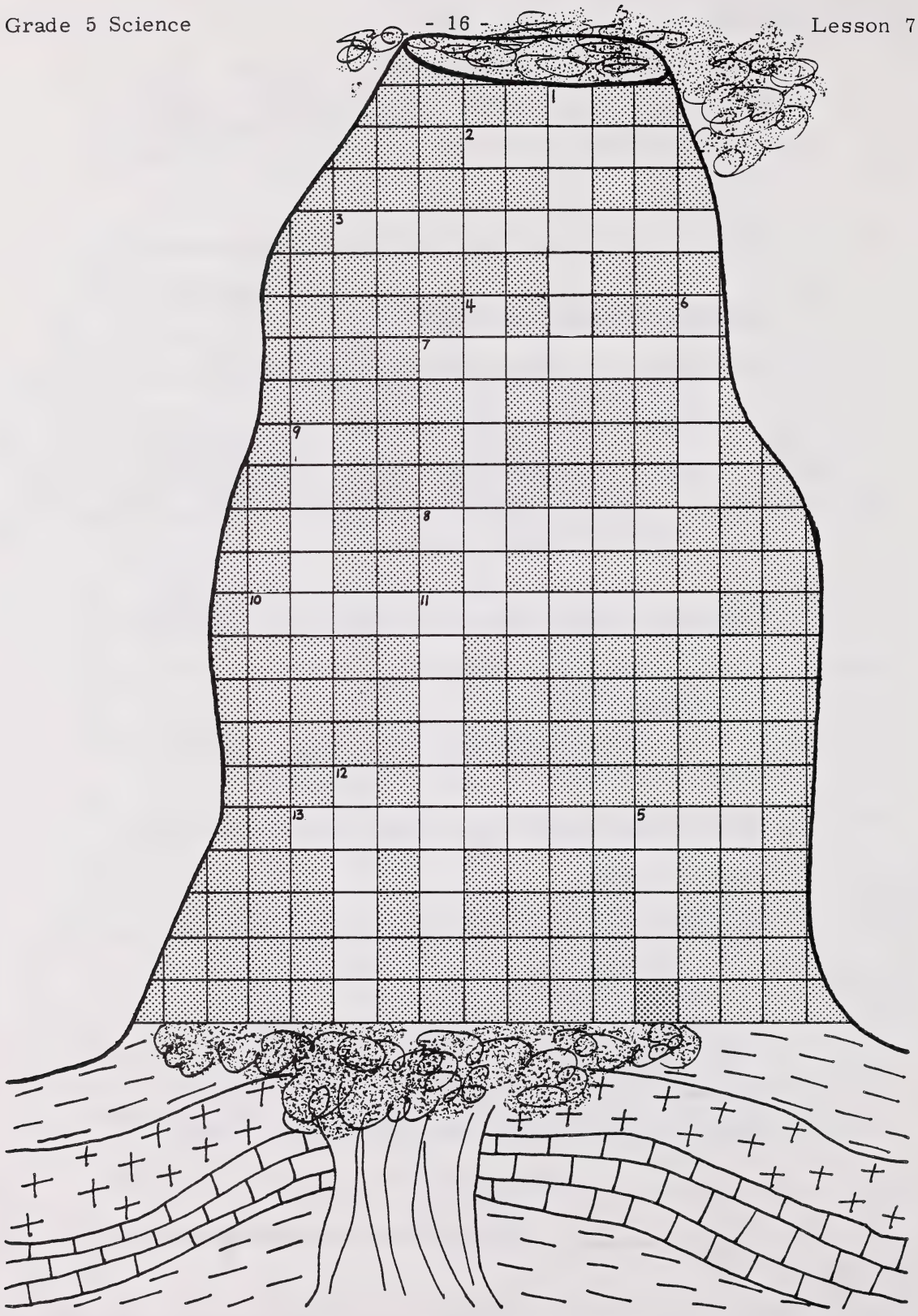
3. Rocks, sand, gravel that a river carries down to the ocean is called _____.

7. Minerals in igneous rocks are found in a form we call a _____.

8. A common example of a mineral in crystal form is _____.

10. The type of rock made from sediments is called _____ rock.

13. _____ rock is often made from sedimentary rock.




Check your work with the answers at the end of Lesson 7.

# ANSWERS FOR LESSON 7

Page 1

1. In Lesson 1, we discussed ways in which our Earth is worn down and changed. Ice, wind, water, sun and plants help wear down our Earth. They are called weathering agents. These agents work at wearing down our Earth and in doing so, soil is formed or moved from one place to another.

Page 2

1. There are cracks in the rock showing where water could get in, freeze and make the cracks larger.

2. There are plants growing on the rocks which help to make cracks in the rocks widen as they grow. They also secrete an acid which helps to wear down the rocks.

3. The river or stream is eroding the land and carrying soil downstream.

4. Ice or glaciers on the mountains help to wear down the rock into soil.

Page 3

3. Water often lies in the cracks of rocks. When molecules of water freeze, they expand. When molecules of ice expand, the crack in the rock is made larger. In this way ice helps wear down the Earth.

   Great rivers of ice called glaciers change the Earth's surface by scraping it with boulders and other debris it carries as it moves.

4. (a) The cracks got larger.
   (b) Water got into the cracks and expanded when it froze, putting pressure on the cracks and widening them.
   (c) It may eventually break apart.

5. (a) packed (b) loosely or tightly (c) tightly or loosely
   (d) Wind (e) loosely (f) odd (g) rain (h) loose
   (i) standing (j) wind or rain (k) rain or wind (l) Hoodoos
   (m) Drumheller

Page 5

6. Water is perhaps the most obvious agent, but wind may have had some effect, too.

7. (a) heats (b) molecules

Page 5

8. (a) These are called frost bumps. They form because of the presence of water.

Page 6

(b) When water beneath a road freezes, it expands and causes the bumps. The traffic on the road hits the bumps and the extra pressure eventually causes holes in the road.

9. The lichens secrete an acid which will eat away at the boards and cause them to rot. The roots of the plants which are growing in the cracks will put pressure on the cracks and make them wider. This may let water into the house through the cracks.

Page 12

(a) 5 (b) 4 (c) 6 (d) 3 (e) 2 (f) 1

Page 14

1. Layers of sedimentary rock are building up.

2. Thick heavy layers of sedimentary rock push down into the magma causing folds.

3. Magma pushes up in places where the layers of sedimentary rock are thinner and bends the rock in waves.

4. antisyncline

Page 16

1. Igneous 2. magma 3. sediments 4. pressure 5. heat
6. slate 7. crystal 8. quartz 9. shale 10. sedimentary
11. minerals 12. weight 13. metamorphic

**LESSON RECORD FORM**

**0504 Science**
Unit I

Revised 03/91

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File Number:

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Sc. 5-1-86

## ALBERTA DISTANCE LEARNING CENTRE

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St. Serv. 9-91

In Lessons 1 - 7,, we explored some of the world of a geologist. We found ways in which our Earth is changing. We saw the effects of these changes.

In the next Lessons, we will investigate the Earth's building blocks. These building blocks are so important that without them there would be nothing to see, touch, smell or taste. In fact without these building blocks we would not even exist. These building blocks are used to make all substances.

What are these building blocks which are so important? What are some of the substances they form?

# FIRST DAY

If you were given salt and sugar on two spoons, how could you tell which one was which?

_____

_____

_____

How does sugar taste? _____

How does salt taste? _____

The salty taste of salt and the sweet taste of sugar are called properties of sugar and salt.

We can taste, smell, feel, see and hear substances to find their properties. The different properties of substances help us tell one substance from another. All substances have more than one property. As an example let's look for the properties of an apple. How do we know what an apple is?

> We can see that it is almost round. Its color can be red, green or yellow. It feels smooth and firm. It has the smell we know as an apple smell. We hear the cracking sound it makes when we bite into it. It tastes sweet or tarty depending on the type of apple it is.

In the above example we see that an apple has many properties that help us know that it is an apple.

In the following list of substances name some properties that help us know each one.

| Substance | Properties |
|---|---|
| 1. cotton batting | _____ |
| | _____ |
| | _____ |
| 2. baseball bat | _____ |
| | _____ |
| | _____ |
| 3. ink | _____ |
| | _____ |
| | _____ |
| Your dresser (or some household object) | _____ |
| | _____ |
| | _____ |

4. If we want to tell one substance from another we describe its (a) _____.

We can discover the properties of substances by (b) _____, _____, _____, _____ and _____.

Check your work with the answers at the end of Lesson 8.

When distinguishing the properties of an unfamiliar substance do not use the taste-test until you're sure it is safe to do so.

## Something for You to Do

1. You can make a game of distinguishing properties. Ask a friend to tell you what you are describing after giving him several properties of an object. Reverse your turns at guessing the object.

## SECOND DAY

We found that by smelling, seeing, feeling, tasting and hearing substances, we can find the properties of a substance. Perhaps you remember that every substance we touch, smell, taste, hear and see is made of very tiny parts. These tiny parts are called molecules. Molecules are so tiny that it requires a powerful microscope to see one.

Just what are molecules? Sugar is made of molecules. Salt is made of molecules. If you wanted the smallest bit of sugar this tiny bit would still have to have the properties of sugar such as sweetness. What would the tiniest piece of sugar be? I hope you thought of the molecule.

A molecule of sugar is the smallest part of sugar that still has the properties of sugar.

One common property of sugar is its sweetness.

1. If one teaspoon of sugar tastes sweet, one molecule of sugar tastes _____.

2. If I wanted the smallest part of salt that still has the properties of salt, what part would I get? (a) _____

Complete the following:

A molecule of salt is

(b) _____

_____

_____

_____

3. If I wanted the smallest part of a piece of wood that still has the properties of wood what part would I get?

(a) _____

What then is a molecule of any substance?

A molecule is the smallest part of a substance that

(b) _____

_____

of the substance.

4. Today then, we remembered that a substance is made up of tiny parts called (a) _____.

The tiniest part of any substance which still has the properties of that substance is the (b) _____.

If you had something smaller than a molecule of salt, would you still have salt? (c) _____ Explain why or why not.

(d) _____

_____

_____

_____

_____

_____

Check your work with the answers at the end of Lesson 8.

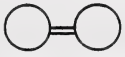
## THIRD DAY

Concepts in Science, page 80

We have seen that the smallest part of salt and sugar that still has the properties of saltiness and sweetness is a molecule of salt and sugar. There are smaller particles than molecules however. These smaller particles are called ATOMS. Several atoms together make up one molecule of a substance.

As an example, oxygen atoms travel in pairs. It takes two oxygen atoms to have the properties of oxygen. So two oxygen atoms make up a molecule of oxygen.

OXYGEN MOLECULE



Two oxygen atoms traveling together are called an oxygen molecule.

All the atoms that make molecules of oxygen are the same. Oxygen is called an ELEMENT.

> IN AN ELEMENT THE ATOMS ARE ALL OF THE SAME KIND.

Elements are so important that without them we couldn't live. The atoms of elements are often called "building blocks". As we continue we will find out why this is such a suitable name.

In our world there are many elements. Some exist as gases, other as liquids and still others as solids. Listed below are 12 common elements.

| | | | |
|---|---|---|---|
| Aluminum | Copper | Iron | Sulphur |
| Carbon | Helium | Nitrogen | Uranium |
| Chlorine | Hydrogen | Oxygen | Zinc |

On page 80 of your text you will find pictures of some of these elements and a description of them all.

Complete the following:

1. Carbon is an element. The atoms of a carbon molecule are all the _____.

2. Hydrogen is an element. The _____ of a hydrogen molecule are all the same.

3. _____ is an element. The atoms of an aluminum molecule are all the same.

4. Oxygen is an (a) _____. The atoms of an oxygen molecule are all the same.

Several atoms together make a molecule of an element.

In the element oxygen, two oxygen atoms go together to make one oxygen molecule. If the two atoms are separate do they have the properties of oxygen? (b) _____ Why or why not?

(c) _____

_____

_____

_____

_____

_____

Check your work with the answers at the end of Lesson 8.

Something for You to Do

1. Find how many things in and around your house are made of elements. Gold rings, copper or aluminum pots, iron as in nails.

2. There are 92 naturally occurring elements. Scientists have made eleven more. If you wish to find the names of these elements, an encyclopedia should have them listed under "Periodic Chart" or "Elements".

## FOURTH DAY

Last day we investigated elements. We found elements contained all the same kind of atoms in each molecule. Some common elements are copper, iron and oxygen.

The atoms of elements are often called "building blocks". Today we will discover why they have this name.

Often atoms of several different elements combine to form molecules of a new substance. For example, the atoms of the elements hydrogen and oxygen combine to form a molecule of water. Water, a new substance, is called a COMPOUND.

One property of a compound then is:

> A COMPOUND IS FORMED WHEN TWO OR MORE ELEMENTS COMBINE.

Do you think the atoms in a molecule of a compound are all the same? _____ Why or why not?

_____

_____

_____

_____

_____

A second property of a compound is:

| THE ATOMS IN A MOLECULE OF A COMPOUND ARE OF DIFFERENT KINDS. |
|---|

Explain in your own words why atoms of elements are called "building blocks".

SEND FOR CORRECTION

Our world consists of elements and compounds. Everything you touch, see, smell, hear, and taste is made of either elements or the combination of elements called compounds.

Since there are so many compounds in our world, we put them into groups. Compounds are grouped according to their various properties. Some compound groups we will study are CARBOHYDRATES, OXIDES, ACIDS and BASES.

## FIFTH DAY

Today we will briefly review some of this week's work. See if you can answer all of the following questions without looking back.

Below are words we met this week. These words are scrambled. Unscramble each word and write it correctly in front of the proper definition. Include the number of the word as well.

1. pcoonumd ____ _____ These are often called "building blocks".

2. steierppor ____ _____ This is the smallest part of a substance that still has the properties of the substance.

3. umleolce ____ _____ The atoms in these are all the same kind.

4. stmoa ____ _____ When two or more elements combine, what is formed?

5. leeemnts ____ _____ When we describe how something feels, smells, tastes, sounds or looks we are describing what?

In the following paragraph are blanks to be filled in with words from this week's work.

In our world all substances contain _____. Two or more _____ join to make "building blocks" called a _____ of a substance. If all the atoms in a substance are the same the substance is called an _____.

Often the _____ of several different _____ join together to make a new substance. This new substance is called a _____. In a _____, the atoms are of _____ kinds. There are so many different substances that we must group them according to their _____. We can use our _____ _____ to find the properties of substances.

SEND FOR CORRECTION

# ANSWERS FOR LESSON 8

Page 2

1. We can see the white color and the varying shapes and sizes and feel the softness.

2. We can feel its hardness, smoothness and weight and see its shape, length and color.

3. We can see the shape it has in the bottle or when spilled. We can also see it is a liquid and what color it is. We could feel whether it is slippery or slimy or tacky. It wouldn't be a good idea, but we could taste it and perhaps smell it.

4. (a) properties (b) hearing, sight, feel, taste, smell

Page 3

1. sweet

2. (a) a molecule (b) the smallest part of salt that still has the properties of salt

Page 4

3. (a) a molecule (b) still has the properties

4. (a) molecules (b) molecule (c) no (d) The smallest part of salt which still has the properties of salt is a molecule.

Page 6

1. same 2. atoms 3. aluminum 4. (a) element (b) No (c) A molecule is the smallest part of a substance which still has the properties of that substance. An oxygen atom does not have the properties of oxygen.

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**0504 Science**
Unit I
Revised 03/91

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## FIRST DAY

CARBOHYDRATES (car bō hī drāte̅s) are a very important group of compounds. If you remember, we found compounds were formed when two or more elements combined. Perhaps we can find what elements compose the group of compounds called carbohydrates.

An example of a carbohydrate compound is sugar. If we are able to break down sugar, we can find the elements that compose it.

PROBLEM: To break down the carbohydrate compound, sugar, to find the elements it is made from.

MATERIALS: Aluminum foil, 1 - 2 millilitres sugar, oven mitts, oven

> Your supervisor should be present when you're doing this investigation using the oven.

PROCEDURE:

1. Form a bowl shape with the aluminum foil.
2. Place the sugar into the foil and fold the foil over the sugar.
3. Place the foil with the sugar into the oven about 8 cm from the broiler.
4. Turn on the broiler and heat the sugar for about 20 minutes.
5. WITH YOUR OVEN MITTS, CAREFULLY take the foil out of the oven. Let the foil cool for a few moments and then open it up.

RESULTS: Describe below what the sugar was like before you put it into the oven. Describe the substance you saw in the foil after it had been in the oven.

BEFORE:

_____

_____

_____

AFTER:

_____

_____

_____

The black substance is called carbon. If you look closely you may see drops of water. It is possible by another process to break water down into hydrogen and oxygen.

The black substance you have now is probably still liquidy. If you heated the sugar UNCOVERED in the oven for a longer time all the water found in the sugar would evaporate. A hard lump of carbon would be left.

CONCLUSION: Name the three elements that go together to make up the carbohydrate compound, sugar.

1. _____

2. _____

3. _____

SEND FOR CORRECTION

Hydrogen, oxygen and carbon each contains one kind of atom and so each is called an element. All compounds in the carbohydrate group contain the elements hydrogen, oxygen, and carbon.

Sugar is just one example of a carbohydrate compound. Starch is also a carbohydrate compound. In your home you may find cornstarch and laundry starch. What elements do you think make up starch? List them below.

_____

_____

_____

SEND TODAY'S WORK FOR CORRECTION

Something for You to Do

1. Make a list of the things you think are compounds in your house. Compare this list with the one you made for elements last week. Which one is larger?

2. Break down starch as you did sugar in today's work.

Do you think that sugar and starch have the same or different properties from the elements carbon, oxygen and hydrogen?

_____

_____

_____

For next day's work prepare the following:

MATERIALS: Steel wool, found in your science kit, an old dish or container, water, vinegar

PROCEDURE:

1. Soak the steel wool in vinegar for a few minutes. This removes the polish put on steel wool to keep it from corroding.
2. Rinse water over the steel wool.
3. Place the wool in the container.
4. Add a few more drops of water to the container and allow it to stand until next day.

SECOND DAY

Concepts in Science 5, pages 60, 62

Last day we saw how the compound, sugar, can be broken down. The elements composing sugar are carbon, hydrogen and oxygen.

Is it possible to build up a compound by combining elements? Let's do some investigating into a common and important compound called rust. On page 62 of your text, Concepts in Science, you will find a picture of rust that has formed on a metal.

PROBLEM: To discover and combine the elements that make the compound, rust

MATERIALS: The steel wool you prepared on the FIRST DAY of this lesson

PROCEDURE: Look carefully at the steel wool to discover any difference in it from last day.

RESULT:

1. Describe the appearance of the steel wool just after you washed it.

_____

_____

2. Describe the appearance of the steel wool now.

_____

_____

The steel wool should have a reddish-brown substance on it. This substance is called rust or iron oxide.

CONCLUSION: What elements do you think make up the compound, iron oxide?

_____ and _____.

The steel wool is made mainly of iron. Oxygen is the other element that makes iron oxide. Where does the oxygen come from? Oxygen is found in the air. Oxygen atoms combine with iron atoms to make rust. The presence of water helps speed up the combining of the two elements.

Iron + Oxygen ——————→ Iron Oxide
*(becomes)*

Iron oxide is a totally new substance with new properties.

To help you understand further how rust is formed, read the first paragraph on pages 60 and 62, under Making a Compound.

In your own words now, explain how the iron oxide was formed on the scouring pad.

_____

_____

_____

_____

_____

_____

_____

At the beginning of this lesson we said rust is an important compound to know about. Why could rust be an important substance to know about?

_____

_____

_____

_____

_____

_____

Read the first paragraph on page 62. Do you agree that rust is an important compound to know about? _____

Why? _____

_____

_____

Something for You to Do

1. You can better demonstrate for yourself the fact that oxygen molecules in the air combine with iron molecules to form rust.

MATERIALS: Steel wool, vinegar, balloon, elastic band, a litre-size pop bottle

PROCEDURE:

1. Soak the steel wool in vinegar for a few minutes.
2. Rinse the steel wool and place it in the bottom of the pop bottle.
3. Stretch the balloon over the bottle neck and secure it with an elastic band.
4. Allow the bottle to sit for 24 hours. Again you will see rust on the steel wool.

RESULTS: What happened to the balloon? Why did this happen? A little more information may help you.

> When a substance changes from a gas to solid, as oxygen in the air did, it takes up less space. This means the amount of gas in the bottle is reduced. Now perhaps you will be able to give a reason for the behavior of the balloon.

If you do this investigation, please tell me about your results and the conclusion you came to.

## THIRD DAY

The compound, iron oxide (rust), which we made yesterday belongs to another group of compounds called OXIDES. When the element, oxygen, combines with any other element an OXIDE COMPOUND is formed.

For example:

ELEMENT + ELEMENT ⟶ *(makes)* OXIDE COMPOUND

Hydrogen + Oxygen ⟶ *(makes)* Hydrogen Oxide

Fill in the following blanks using the above example as a guide.

| | ELEMENT + ELEMENT | | OXIDE COMPOUND |
|---|---|---|---|
| 1. | Iron + Oxygen | ⟶ | _____ |
| 2. | Copper + _____ | ⟶ | Copper Oxide |
| 3. | Mercury + Oxygen | ⟶ | _____ |
| 4. | _____ + Oxygen | ⟶ | Aluminum Oxide |
| 5. | Carbon + _____ | ⟶ | Carbon Dioxide |

Oxygen reacts more quickly with some elements than others so that the oxide may be formed more quickly with some elements than others.

Check your work with the answers at the end of Lesson 9.

We know that one oxide forms very quickly and that is rust or iron oxide. Perhaps you have seen the reddish-brown marks of rust on your bike or on some garden tools. Generally when oxygen and water are present, rust forms. How might you keep your bike from becoming rusty?

_____

_____

_____

_____

_____

Keeping your bike dry will help prevent rusting. Paint, oil and grease applied to various bike parts will help prevent rusting.

## FOURTH DAY

In the last lessons we have discussed and investigated compounds. Sugar is a compound we broke down. We made rust which we found belonged to a group of compounds called oxides.

There are two other groups of very important compounds. The names of these groups are BASES and ACIDS. To discover substances which are acids and bases we can use LITMUS PAPER. Litmus paper is blue or pink. When a substance is put on litmus paper a color change will occur on the blue or pink paper.

Vinegar is called an acid. Ammonia (ammonium hydroxide), found in household cleansers such as Pine Sol, belongs to the base group of compounds. Using vinegar and ammonia we can test pink and blue litmus to find which color they turn with an acid and a base.

PROBLEM: To test the color change in litmus paper using an acid and a base

MATERIALS: 2 strips of pink litmus, 2 strips of blue litmus (found in your science kit), vinegar, household ammonia (Pine Sol or other such cleaners), 1 medicine dropper

PROCEDURE:

1. With a medicine dropper place a few drops of vinegar on one strip of pink litmus and one strip of blue litmus paper. Observe any color change.

2. Wash your medicine dropper thoroughly by running hot water through it.

3. Place a few drops of ammonia on one strip of pink litmus and one strip of blue litmus paper. Observe any color change.
   BE CAREFUL NOT TO GET AMMONIA IN YOUR EYES OR MOUTH.

4. Wash the medicine dropper thoroughly with a little sudsy water.

RESULTS: If you found that the blue and pink litmus changed colors in vinegar or ammonia, circle the correct answers in the following.

1. PINK LITMUS changed to (PINK, BLUE) when placed in (AMMONIA-base, VINEGAR-acid).

2. BLUE LITMUS changed to (PINK, BLUE) when placed in (AMMONIA-base, VINEGAR-acid).

CONCLUSION: An acid turns blue litmus paper to

3. _____.

A base turns pink litmus paper to

4. _____.

Check today's work with the answers at the end of Lesson 9.

## FIFTH DAY

The acid and base groups of compounds are common. Many of the acids and bases such as vinegar and ammonia are found in your home. Tell how you could test substances such as lemon juice or baking soda to find if they belong to the acid or base group of compounds.

_____

_____

_____

_____

_____

PROBLEM: To discover a substance which belongs to the acid or base group of compounds

MATERIALS: baking soda, lemon juice (orange or grapefruit would do), milk, salt, warm water, 4 strips of pink litmus and 4 strips of blue litmus

PROCEDURE:

1. Place 5 millilitres of baking soda in 45 millilitres of warm water. Stir until the soda is dissolved in the water.

2. Place 5 millilitres of salt in 45 millitres of water. Stir until the salt is dissolved.

3. Place a few drops of lemon juice and a few drops of milk in SEPARATE containers.

4. Place a little of each substance, milk, lemon juice, baking soda and salt solutions on the 8 pieces of pink and blue litmus paper.

5. Observe the color changes, recording each change as it occurs.

RESULTS:

| Substance | Did a Color Change Occur? | Blue Litmus was Changed to: | Pink Litmus was Changed to: |
|---|---|---|---|
| Lemon | | | |
| Baking Soda Solution | | | |
| Salt Solution | | | |
| Milk | | | |

CONCLUSION:

1. Which of the substances you tested are acid compounds and which contained base compounds?

ACID COMPOUND BASE COMPOUND

_____ _____

_____ _____

_____ _____

2. Salt did not change the litmus paper to a different color. Do you think salt belongs to either the base or acid group of compounds?

_____

You may remember that we talked about the pressure of growing plants that could force a rock crack wider. In addition to this pressure, plants produce an acid in their roots. This acid "eats" away at the rock gradually breaking it down into soil. The acid is called CARBONIC acid. It is called a weak acid. What do you think is meant by a weak acid?

For the beginning of next week's lesson prepare the following:

MATERIALS: Limewater tablets, a plastic container (such as a cottage cheese container) with a lid

PROCEDURE:

1. Put the limewater tablet into the container.
2. Fill the container with water.
3. Place the cap on the container.
4. Do not remove the cap until we are ready to use the limewater on FIRST DAY, of Lesson 10.

Check today's work with the answers at the end of Lesson 9.

ANSWERS FOR LESSON 9

Page 9

1. iron oxide 2. oxygen 3. mercury oxide 4. aluminum
5. oxygen

Page 12

1. blue, ammonia-base
2. pink, vinegar-acid
3. pink or red
4. blue

Page 13

You could use litmus paper to find if the substances are acids or bases.

Page 14

RESULTS:

| Substance | Did a Color Change Occur? | Blue Litmus was Changed to: | Pink Litmus was Changed to: |
|---|---|---|---|
| Lemon | Yes | pink | no change |
| Baking Soda Solution | Yes | no change | blue |
| Salt Solution | No | no change | no change |
| Milk | Yes | pink | no change |

Page 14

1.

| Acid Compound | Base Compound |
|---|---|
| lemon | baking soda |
| milk | |

2. It belongs to neither group.

Page 15

A weak acid is one which takes a long time to work. It does not eat away at things quickly.

**LESSON RECORD FORM**

**0504 Science**

Unit I

Revised 03/91

Parent's or Supervisor's Comments:

Signature

**For Student Use**

(If label is missing or incorrect)

File Number:

Lesson Number:

Date Lesson Submitted:

Grading Scale:

A - Very Satisfactory
B - Satisfactory
C - Weak
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*Please verify that preprinted label is for correct course and lesson.*

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Lesson Grading

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Sc. 5-1-86

## ALBERTA DISTANCE LEARNING CENTRE

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### 2. POSTAGE REGULATIONS

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**Send all letters in a separate envelope.**

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First Class

**Take your lesson to the Post Office and have it weighed. Attach sufficient postage** and a green first-class sticker to the front of the envelope, and seal the envelope. Correspondence lessons will travel faster if first-class postage is used.

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**When you register for correspondence courses, you are expected to send lessons for correction regularly. Avoid sending more than two or three lessons in one subject at the same time.**

St. Serv. 9-91

## FIRST DAY

We are going to investigate still another compound today. Perhaps you will remember that in Lesson 5, Day 5 we found that when limestone rock had vinegar poured on it, bubbles appeared.

The appearance of these bubbles showed us carbon dioxide was present. Carbon dioxide is a very important compound as we shall find out later. Plants, animals and humans produce carbon dioxide. The air we breathe in contains mostly oxygen. However, when we exhale or breathe out we have breathed out carbon dioxide. This carbon dioxide is produced within us.

When carbon dioxide comes in contact with limewater, the limewater turns milky. Let's do an investigation to find if carbon dioxide is produced within us.

PROBLEM: To test if $CO_2$ is produced within us

MATERIAL: The limewater you prepared yesterday, 1 piece filter paper, a jar with a lid, a soda straw

PROCEDURE:

1. Place the filter paper over the jar.
2. Carefully pour the limewater through the filter into the jar. Be sure to leave room above the liquid for air. This air is the same as what we breathe in.
3. Does the air at the top of the liquid have enough $CO_2$ to make the limewater milky? Seal the jar with the lid. Shake the contents of the jar to mix the air with limewater. Observe any change.
4. Take the lid off. With the soda straw <u>exhale</u> air through the straw into the limewater.
5. Repeat No. 4 several times or until you note a change in the limewater.

RESULTS: 1. Was there a change in the limewater when you mixed it with air? (a)_____

If there was a change in the limewater describe the change.

(b)_____

_____

_____

_____

2. Was there a change in the limewater when you breathed into the limewater?

(a)_____

_____

_____

_____

CONCLUSION: We know that carbon dioxide turns limewater milky. After this investigation would you say carbon dioxide is made within us?

(b)_____

Our bodies do produce carbon dioxide. How this is done we will investigate later.

Check your work with the answers at the end of Lesson 10.

SECOND DAY

Perhaps you can recall from past science work, what a PHYSICAL CHANGE is. If you do remember, tell what it is.

1. _____

_____

_____

_____

_____

Water is perhaps the best example we have to help us understand physical change.

2. Let's think of the different FORMS we can find water in.

Water vapor is a

(a) _____. We say that water can be in the form

of a (b) _____.

A river, pond, lake or stream contains water that might be suitable for swimming, boating or drinking. We say water in a river, pond, lake or stream is in the form of a

(c) _____.

When we skate on ice, or see frost on our window pane

we say water is in the form of a (d) _____.

Perhaps you really had to think hard to answer the questions above. Water can be in the form of a SOLID (ice), GAS (water vapor), or a LIQUID (lakes etc.). In any of these three forms it is still water. When water changes its form from gas to liquid, or solid to liquid we say a physical change has taken place.

> In a PHYSICAL CHANGE the same substance may have different forms. A different substance is not formed.

There is another kind of change. The compounds we have talked about in the last two weeks are involved in this change. It is called a CHEMICAL CHANGE. A different substance is formed, in a chemical change.

For example:

OXYGEN and IRON combine to form IRON OXIDE.

Here a compound is built up.

The properties of iron oxide are not the same as the properties of iron and oxygen. Iron oxide is a different substance. A chemical change has taken place.

When a compound breaks down the substances are different again.

For example:

SUGAR breaks down into CARBON, HYDROGEN and OXYGEN.

Sugar does not have the same properties as carbon, hydrogen or oxygen. Carbon, hydrogen and oxygen are different from sugar.

> When a compound breaks down or builds up a different substance(s) is found. This is a CHEMICAL REACTION.

> The change that takes place in a chemical reaction is called a CHEMICAL CHANGE.

In the following, tell if the change is a chemical or physical change.

1. In an experiment, water was found to be made of hydrogen and oxygen. A _____ change occurred here.

2. The water vapour condensed and clouds formed. Soon it began to rain. A _____ change occurred here.

3. The liquid jelly became stiff in the fridge. A _____ change occurred here.

4. The cookies in the oven were so burnt only a black substance remained. A _____ change occurred here.

5. The long icicles slowly dripped away until they were gone. A _____ change occurred here.

6. We all enjoyed the burning of the leaves in the fall. A _____ change occurred here.

Check your work with the answers at the end of Lesson 10.

## THIRD DAY

When a friend of yours has a two syllable name as Linda (Lin / da) or a longer name, perhaps you find yourself shortening the name. Linda might become Lin. Diane could become Di. Douglas would probably be shortened to Doug.

When scientists write the elements, they too use a shortened form. This shortened form is called a SYMBOL. See the examples below.

| ELEMENT | SYMBOL |
|---|---|
| Aluminum | Al |
| Calcium | Ca |
| Sulphur | S |
| Nitrogen | N |
| Boron | B |

You probably noticed that the symbols for the elements were taken from the first or first and second letters of the elements' full name. This is not always the case. For example:

| ELEMENT | SYMBOL |
|---|---|
| Sodium | Na |
| Iron | Fe |
| Copper | Cu |
| Potassium | K |
| Silver | Ag |

Last day we spoke of chemical changes. We learned that in a chemical change a different substance was the result. Water can be broken down into hydrogen and oxygen. We can talk about chemical changes by using a CHEMICAL EQUATION (ē-kwā-shun). A chemical equation may use WORDS to describe the chemical change.

For example:

1. Sugar $\xrightarrow[\text{(becomes)}]{}$ Carbon and Water

2. Water $\xrightarrow[\text{(becomes)}]{}$ Hydrogen and Oxygen

A chemical equation may use SYMBOLS to describe a chemical change.

For example:

1. $CHO \rightarrow C + H_2O$

2. $H_2O \rightarrow H + O$

Symbols or words can be used in a CHEMICAL EQUATION when describing a chemical change.

When a CHEMICAL EQUATION uses words, we will call this a WORD EQUATION.

When a CHEMICAL EQUATION uses symbols we will call this a SYMBOL EQUATION.

Here are some more CHEMICAL EQUATIONS using words and symbols.

SYMBOL EQUATION - When we see:
$CHO \rightarrow C + H_2O$

WORD EQUATION - We read:
Sugar becomes carbon and water.

SYMBOL EQUATION - When we see:
$H_2O \rightarrow H + O$

WORD EQUATION - We read:
Water becomes hydrogen + oxygen.

Earlier we learned about oxide compounds. We talk about oxide compounds with chemical equations that use words and symbols.

ELEMENT: Copper
SYMBOL: Cu

ELEMENT: Oxygen
SYMBOL: O

SYMBOL EQUATION - $Cu + O \rightarrow CuO$

WORD EQUATION - Copper and Oxygen become Copper Oxide

In the exercise below, fill in the missing parts, using the example from the last page as a guide.

1. ELEMENT: Iron
   SYMBOL: Fe

   ELEMENT: (a) _____
   SYMBOL: O

SYMBOL EQUATION: (b) _____

WORD EQUATION: Iron and oxygen become iron oxide.

2. ELEMENT: Zinc
   SYMBOL: Zn

   ELEMENT: (a) _____

   SYMBOL: O

SYMBOL EQUATION: $Zn + O \rightarrow ZnO$

WORD EQUATION: (b) _____

3. (a) _____: Aluminum

SYMBOL: Al

ELEMENT: Oxygen
SYMBOL: O

SYMBOL EQUATION: (b) _____

WORD EQUATION: (c) _____

4. ELEMENT: (a) _____

SYMBOL: H

ELEMENT: (b) _____

SYMBOL: O

SYMBOL EQUATION: $H + O \longrightarrow H_2O$

WORD EQUATION: (c) _____

Check your work with the answers at the end of Lesson 10.

## FOURTH DAY

We have been talking about compounds that are broken down and built up.

Is any weight lost or gained when elements combine or compounds are broken down? Let's look at an oxide compound.

OXYGEN + COPPER ⟶ COPPER OXIDE

The weight of oxygen is 32 milligrams.

The weight of copper is 64 milligrams.

Would the weight of oxygen (32 milligrams) plus the weight of copper (64 milligrams) be

less than,

more than, or

the same as,

the weight of copper oxide. Underline your answer.

I hope you said the two weights would be the same.

| | Oxygen | + | Copper | ⟶ | Copper Oxide |
|---|---|---|---|---|---|
| Weight: | 32 milligrams | + | 64 milligrams | ⟶ | 96 milligrams |

32
+ 64
96 milligrams

We do not gain or lose any copper or oxygen when they combine to form copper oxide. Therefore the weight of oxygen plus copper is equal to the weight of copper oxide. The atoms have simply changed places to form a new substance.

In a chemcial reaction
no substance is lost
or gained.
The total weight of the
elements is equal to the
weight of the compound.

In the following, find the different weights.

1. Mercury + Oxygen → Mercury Oxide
   40 milligrams + 35 milligrams → _____ milligrams

2. Sulphur + Oxygen → Sulphur Dioxide
   _____ milligrams + 14 milligrams → 74 milligrams

3. Copper + Oxygen → Copper Oxide
   15 milligrams + _____ milligrams → 24 milligrams

Make up your own weights.

4. Aluminum + Oxygen → Aluminum Oxide
   _____ milligrams + _____ milligrams → _____ milligrams

Check your work with the answers at the end of Lesson 10.

## FIFTH DAY

We have talked about atoms, compounds, elements, molecules and properties in the past three lessons. The following questions should be done without looking back at your work.

When you have completed the questions you may go back to check on your answers. However, your first answers should not be changed.

1. Carbon dioxide is a compound made up of the

   elements _____ and _____.

2. A certain liquid is tested with pink litmus. The pink litmus remains pink. However, blue litmus is turned pink by the liquid. To what compound group does the liquid belong?

   _____

3. One hundred grams of the compound, hydrogen chloride, was broken down into its elements, hydrogen and chlorine. How much did the two elements, together, weigh?

   _____

4. There are about how many elements on Earth?

   a. 25 c. 75
   b. 50 d. 100

5. The smallest particle of a compound which still has the properties of that compound is

   a. an atom c. an element
   b. a molecule d. a substance

6. In an ordinary chemical reaction

   a. weight is lost.
   b. weight is gained.
   c. weight is neither lost nor gained.

7. In the Earth's crust, which compound do you think is found in the greatest amount?

a. acids
b. bases
c. oxides
d. gases

Why?

_____

_____

_____

_____

_____

_____

SEND FOR CORRECTION

# ANSWERS FOR LESSON 10

Page 2

1. (a) No (b) There should be no change

2. (a) Yes. The limewater should turn milky. (b) Yes

Page 3

1. A physical change is a change in the physical properties of a substance or a change in form.

2. (a) gas (b) gas (c) liquid (d) solid

Page 5

1. chemical 2. physical 3. physical 4. chemical
5. physical 6. chemical

Page 8

1. (a) oxygen (b) Fe + O = FeO

2. (a) oxygen (b) zinc and oxygen become zinc oxide

Page 9

3. (a) element (b) Al + O = AlO (c) aluminum and oxygen become aluminum oxide

4, (a) hydrogen (b) oxygen (c) hydrogen and oxygen become hydrogen oxide or water

Page 11

1. 75 2. 60 3. 9 4. example 10 + 20 -> 30

# LESSON RECORD FORM

**0504 Science**
Unit I

Revised 03/91

Parent's or Supervisor's Comments:

_____
Signature

**For School Use Only**

Assigned
Teacher: _____

Assignment
Code: _____

Graded by: _____

Lesson Grading
Science: _____
Health: _____
Neatness: _____

Date Lesson Received:

_____

Lesson Recorded: _____

**For Student Use**

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File Number:

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Lesson Number: _____

Date Lesson Submitted:

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*Please verify that preprinted label is for correct course and lesson.*

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St. Serv. 9-91

# FIRST DAY

## Music

If you have been keeping your work schedule since September, you should be doing the next three lessons just before Christmas. Now you are going to take a break from doing science work. Instead of science you are going to do some listening.

Stop what you are doing and just listen to the different sounds around you. Listen carefully. On the lines below, write the sounds you can hear.

_____

_____

_____

_____

_____

_____

There are pleasant sounds and some not so pleasant. The sounds you hear, tell you things about the world around you.

Perhaps two of the favorite sounds people like to hear are the sounds of music and of a story. You are going to listen to an old Christmas story which may be a new story to you. Most probably, boys and girls in Germany heard the story first, because it was written by a German story-teller named Mr. Hoffman. He called the story, The Nutcracker and the Mouse King.

Maybe your family has a nutcracker which is used especially at Christmas time to break open walnuts or hazel nuts. A nutcracker can look like this.

What connection could there be between a nutcracker and the Mouse King? You will find out later in the lesson.

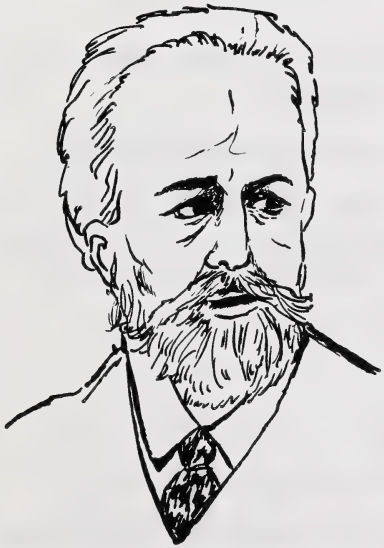
The Nutcracker and the Mouse King is a fairytale. This means it is not true and is meant only for the fun of listening and trying to imagine all the things that happen in the story. This story spread to many different countries.

While this story was being told from country to country, a boy named Peter Tchaikovsky (Chī kof′skē) was living in the Russian town of Votkinsky. A story is told about 5-year-old Peter who imagined that he saw some *Cossack (kos′ăk) soldiers on their beautiful horses. He imagined the horses with riders were galloping by his house on a stormy evening. The imaginary picture excited him so much that he started to beat the rhythm of the galloping horses on the window. He beat so hard that the glass broke and cut his hand. Peter's mother understood that he had imagined the Cossack soldiers on their horses and that he had been beating the rhythm of the galloping horses.

*Cossack - a group of the Russian people who were very skilled horsemen and fierce soldiers.

Peter was given music lessons and soon he began to compose music and make up tremendous stories which he told to his friends. No one thought Peter had any special musical ability and so he went on to study at law school. However, Peter never forgot about music. Finally when he was about 23 years old, he decided to spend the rest of his life studying and composing music.

Mr. Tchaikovsky liked to write music to go with stories. The music he wrote told the story even without words being spoken.



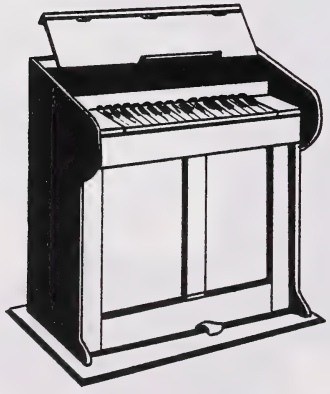
Peter Ilich Tchaikovsky

During Peter Tchaikovsky's lifetime, the story, The Nutcracker and the Mouse King, continued to spread to different countries. When the story reached Russia, something very important happened to it: something which made the story famous all over the world.

When some Russian people heard the story, The Nutcracker and the Mouse King, they decided they should make it into a ballet. Now a ballet is a way of acting a story, but it is different from a play. In ballet there is no speaking. The performer tells the story by *miming (mim - ing) and dancing to the music of the orchestra. Because of the dancing, music is always an important part of ballet. So, ballet is a story told with dancing and music, but no words. Someone had to work out all the dance movements, someone had to design the costumes and scenery and someone had to write the music. The person who wrote the music to go with the story, for this ballet, was Mr. Tchaikovsky. This was in the year 1892. The story, The Nutcracker and the Mouse King, became known as the ballet called The Nutcracker.

Mr. Tchaikovsky also wrote the music for the famous ballets, Swan Lake and The Sleeping Beauty.

While Mr. Tchaikovsky was writing the music for The Nutcracker Ballet, he went to Paris. In Paris he saw a new musical instrument called a celesta (sə les ta). He liked it so much he decided to use it in the ballet music. You will hear the tiny tinkling-like sound of a celesta when you listen to the music for The Nutcracker Ballet.



The celesta looks like a piano but inside are little metal bars, which when struck by hammers, produce a bell-like sound. This is the instrument Mr. Tchaikovsky found when he was in Paris and writing the music for The Nutcracker Ballet.

*miming - to act without words

Complete the following.

1. In your own words tell what a ballet is?

2. Give the name of the man who wrote the music for the ballet called The Nutcracker.

Check your work with the answers at the end of Lesson 11.

SECOND DAY

Music

When Mr. Tchaikovsky wrote the music for The Nutcracker Ballet, he planned to have many instruments play the music. All of these instruments together are called the ORCHESTRA (ôr' - kĭs - trə).

The instruments which make up the orchestra belong to four families of instruments.

The Orchestra's Family of Instruments

1. The Stringed Instruments

   (1) The violin, viola, violincello and double bass belong to this family.

      a. They are all played with bows, which are drawn across strings.

      b. The violin plays the high-voiced music, while the double bass plays the low-voiced music.

2. The Wood Wind Instruments

   (1) The flute, oboe, English horn, clarinet and saxophone belong to this group.

      a. They are played by blowing into them. They were originally all made from wood. A special piece of wood called a reed (rēd) is put into the mouthpiece where the player blows. This reed gives the instrument its particular sound.

      b. The sounds from the wood winds are often described as sad or slightly mysterious, but they can be light and airy sounds as well.

3. The Brass Wind Instruments

   (1) The trumpet, French horn, trombone and tuba belong to this family.

      a. They are played by blowing into them.

      b. These instruments are played where battlefields, royal courts, hunts or religious ceremonies are being talked about in music.

4. The Percussion Instruments

(1) The tympani, snare drum, bass drum, cymbals, chimes, xylophone, tambourine, castanets, glockenspeil and celesta belong to this group.

a. These instruments are played by being struck with a mallett (mal´ it), stick, or by being struck one against the other as are cymbals.

b. They help accent or mark the rhythm or beat of the music.

c. Some add to the musical tone as well.

Harp

a. The harp does not belong to the stringed instruments because it is not played with a bow. The harp is played by plucking the strings with the fingers.

b. The harp does not always appear with the orchestra.

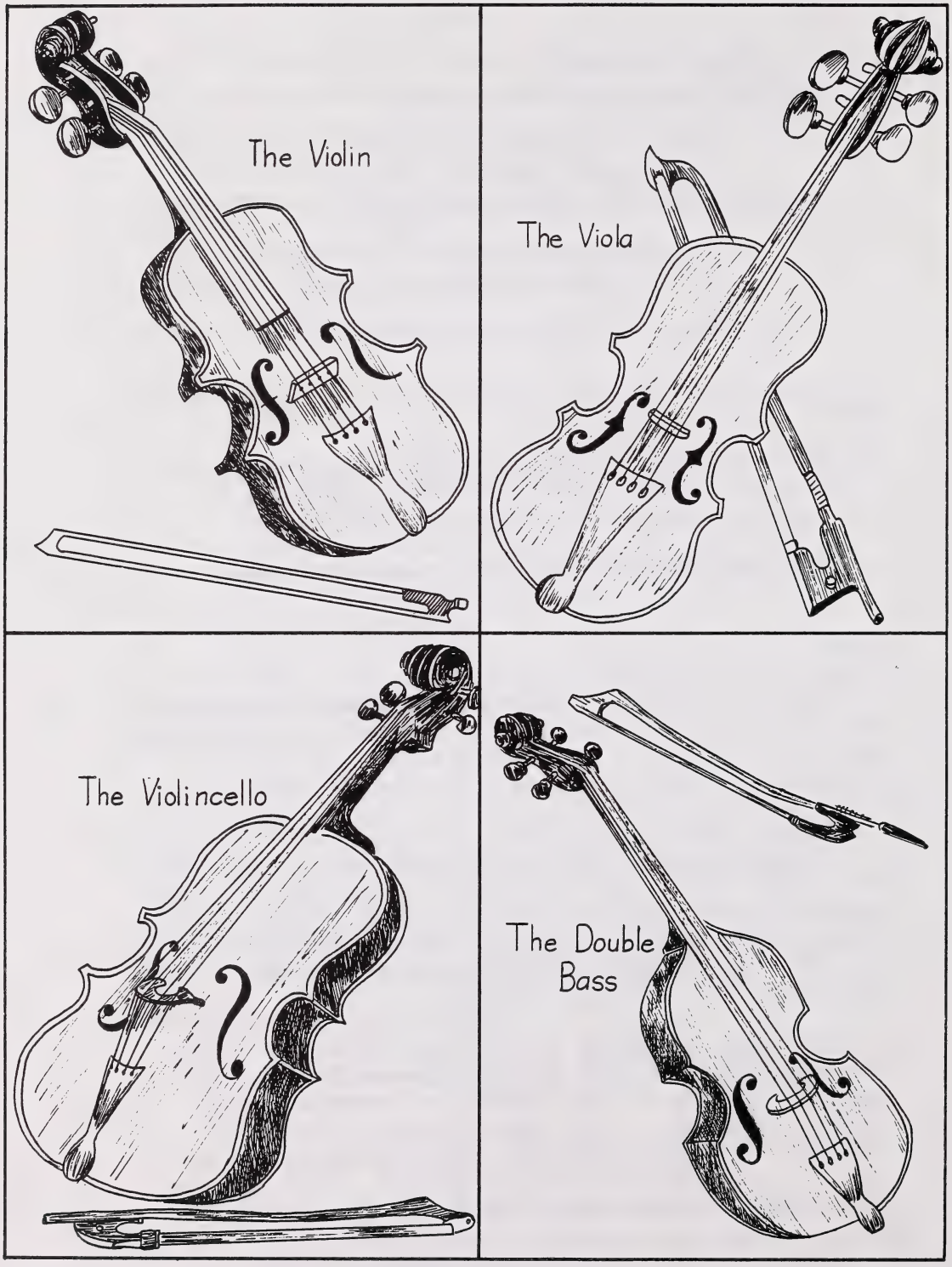
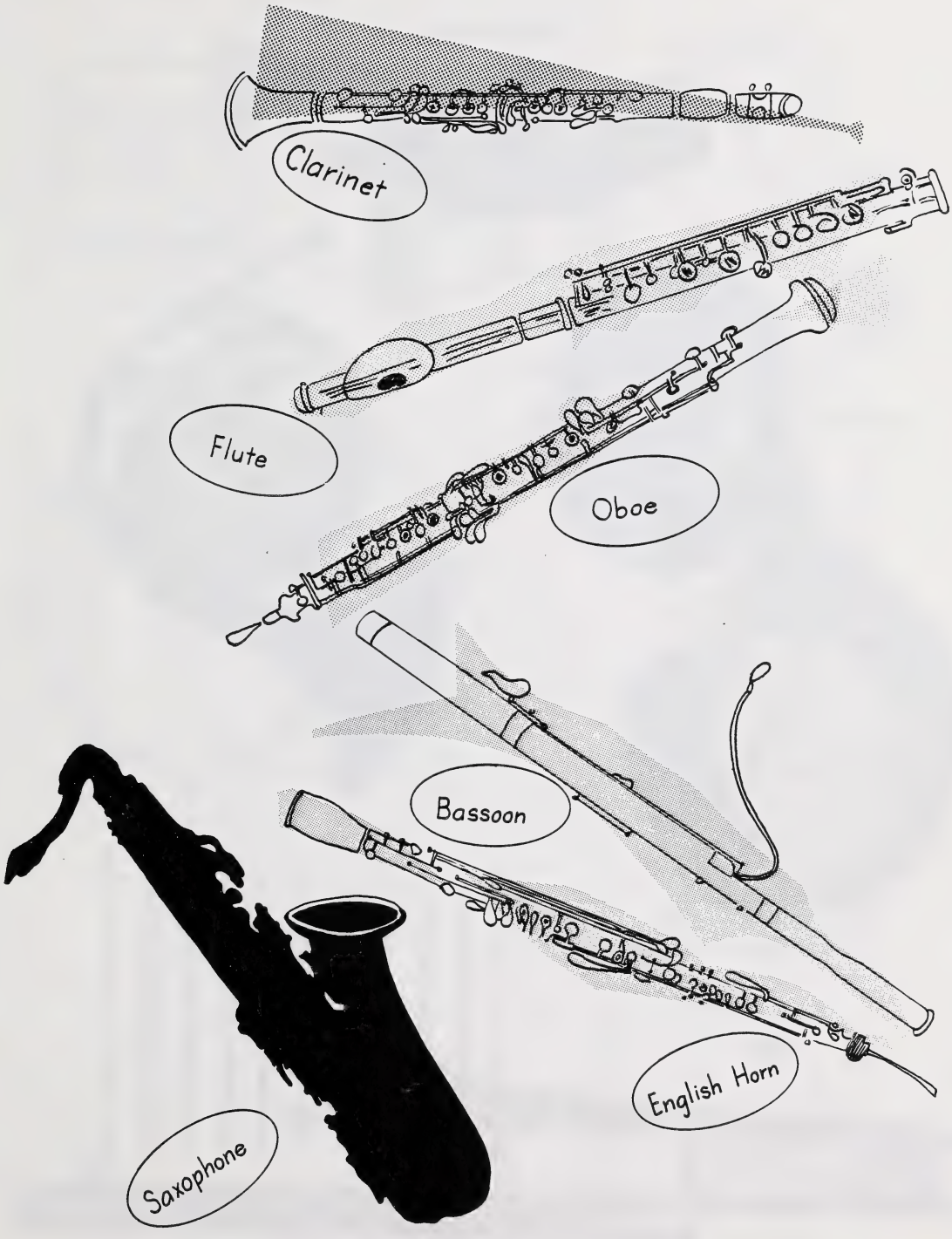
Piano

The piano does not usually play as part of the orchestra. It usually has a solo part with the orchestra as a background for it.

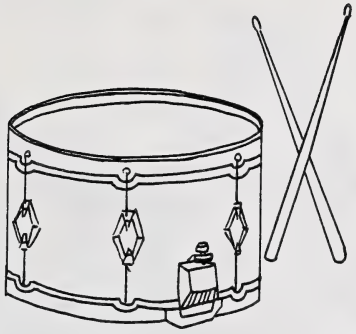
In the first piece of music on your tape, you will hear music from each of the four families of instruments in the orchestra. First you will hear the mighty brass family by itself. Then in a great flurry the stringed instruments rush in. Back and forth they play, brass, then strings. Finally, for a short time, they play together.

The brass and string families soon attract the rolling thunder of the percussion and the light-sounding wood wind families. Finally all four families of instruments play together for awhile. This piece of music is about five minutes long, but you will hear only the first minute and a half. As you listen with your supervisor, try to tell when each family of instruments is being played.

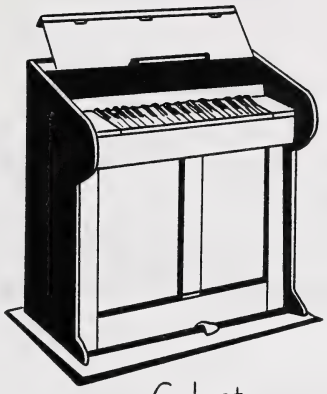
*Turn your tape on now. Listen carefully.*


The Violin
The Viola
The Violincello
The Double Bass

Clarinet
Flute
Oboe
Bassoon
English Horn
Saxophone

Trumpet
Tuba
French Horn
Trombone

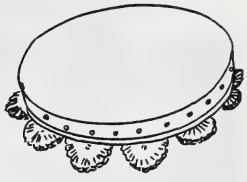


Snare Drum

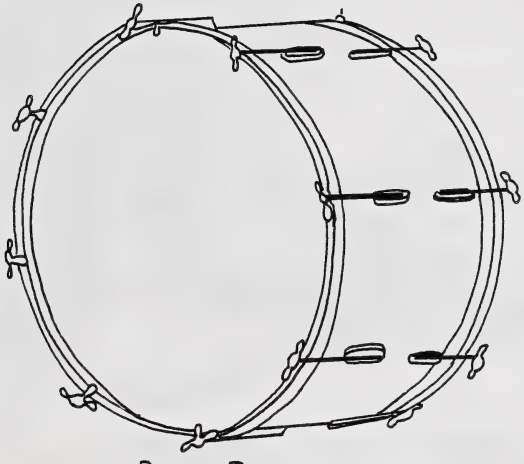


Celesta

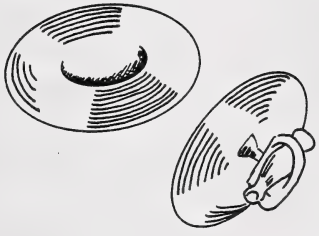
Castanets



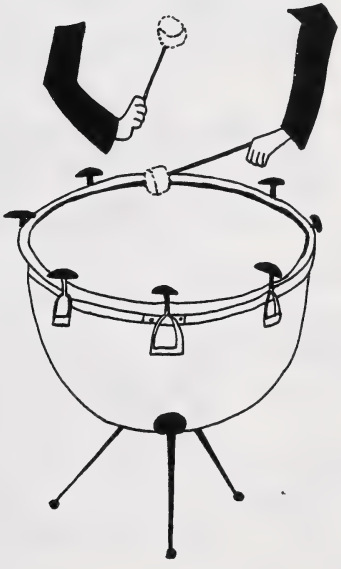
Tambourine



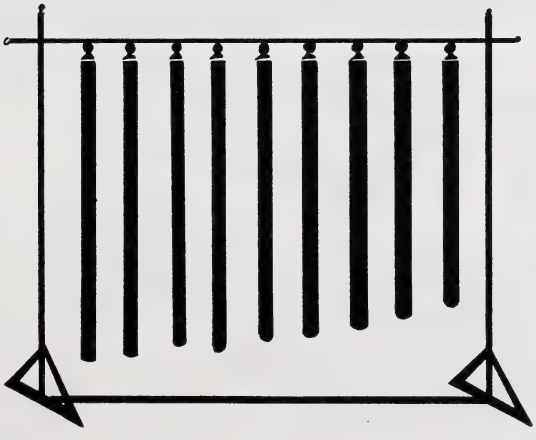
Bass Drum



Cymbal



Timpani (kettledrum)



Chimes

## THIRD DAY

### Music

It would be great if you could see and hear the ballet, The Nutcracker. You can't see the dancers, but you can listen to the music from the ballet.

When you hear the music from a ballet without seeing the dancers, the music is given a special name. The music is called a suite (swēt).

> A suite is only the music from a ballet.

The Nutcracker Suite contains just the music from The Nutcracker Ballet.

Mr. Tchaikovsky's music tells the story about The Nutcracker. You are going to hear the story told with words and listen to the story, as Mr. Tchaikovsky told it with music.

The story is on the tape along with the music. You may listen to the story and music. Or you may follow the story as it is written on the following pages. As you listen to the story and the music, try to imagine the various scenes.

*Turn on your tape. Enjoy the musical story.*

# The Nutcracker and the Mouse King

## Chapter One

## Christmas Eve

This is the story of a nutcracker — a very special nutcracker, as you will see. It begins late in the afternoon on Christmas Eve, in a big room in a large house in Germany many years ago.

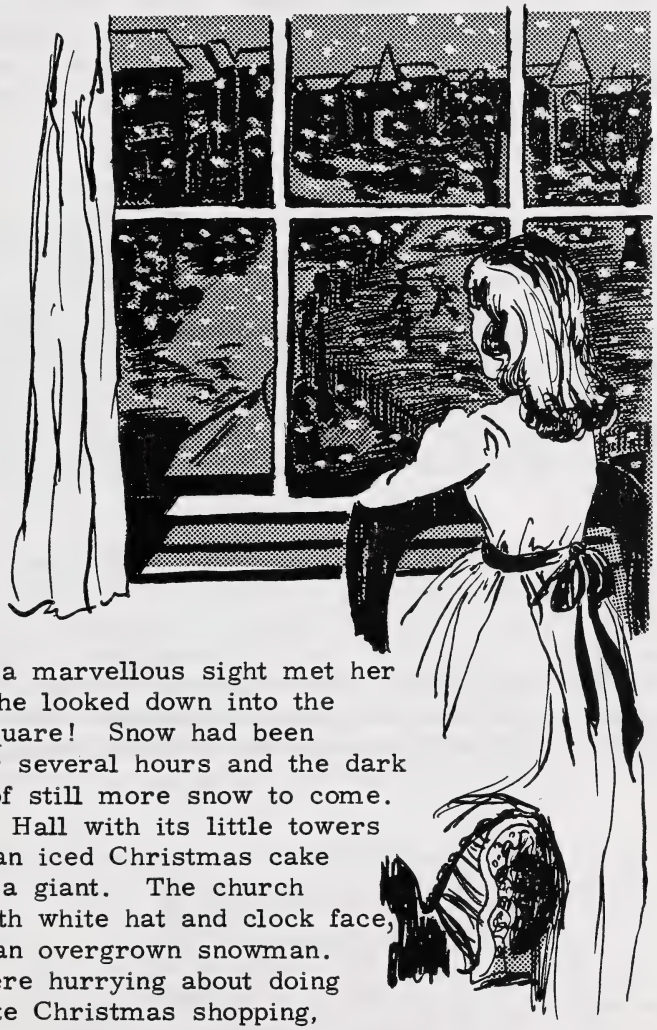
Clara and her brother Frank were going to give a party and the room was all ready for the festive occasion. At one end of the room there was a magnificent Christmas tree with a silver star at its tip. On the branches were colored candles: red ones, yellow ones, green, blue and white ones, all waiting to be lit. Other branches were bending under the weight of parcels in gay wrappings.

Beside the Christmas tree stood a huge table, almost touching the walls on either side. It was covered with a gleaming white cloth, and on the cloth were plates filled with delicious sandwiches, scrumptious pies, rich crumbly cake, shiny fruit and sweets — oh just oodles of mouth-watering sweets, and all the other wonderful things you must have at Christmas.

Overhead were brightly-colored paper chains and streamers. In the middle of the room was a large open space for dancing and games.

Soon the room would be noisy and full of people in gay, festive moods. But now there was neither sound nor movement except for the quiet ticking of the clock on the wall. The chairs sat gazing at each other across the floor. The Christmas tree, torn from its friends in the forest, looked lonely. It was spending its first Christmas indoors and wondered what was going to happen. Little did it know what surprising events it would see before the night was over!

The door opened and Clara came into the drawing-room, ready for the party in a long, lovely dress. She was ten years old. She glanced at the tree, the table and the chairs, to make sure that everything was all right; then she went to the window to watch for the first guests arriving.



What a marvellous sight met her eyes as she looked down into the market square! Snow had been falling for several hours and the dark sky told of still more snow to come. The Town Hall with its little towers was like an iced Christmas cake made for a giant. The church tower, with white hat and clock face, was like an overgrown snowman. People were hurrying about doing last-minute Christmas shopping, their heavy coats buttoned up to the top. Feet left deep patterns on the white carpet. Long ribbons of light from shop doorways and windows shone on the snow making it sparkle. Some children were having a snowball fight, running backwards and forwards as they pelted each other, shouting with excitement.

Soon Frank came into the room. He was two years older than Clara. Clara couldn't help but notice that Frank had gone to extra trouble getting ready for the party. Why he wore his best clothes, his face actually looked scrubbed and his hair was even combed! "Anyone coming yet?" he asked. "No, not yet," replied Clara. Frank went to the table to look at the sweets. He couldn't resist popping two to three almonds into his mouth. Then Frank looked for his parcel on the tree and was pleased to find that it was nice and big.

At that moment Clara cried, "They're coming!" Frank ran to join Clara at the window. The first guests were crossing the square, laughing and talking as they came. Frank raced to the front door, but Clara in her long gown had to follow more slowly. When she had reached the hall, Frank had already opened the door to a group of excited friends who were busily stamping their feet on the step to get rid of the snow. Soon coats, hats, gloves and scarves were hung up. There was a constant knocking at the front door as more guests arrived.

And so the story of the Nutcracker begins. Mr. Mr. Tachaikovsky told us this part of the story with music. He composed a piece of music called an OVERTURE (ō´ vər chər).

> An OVERTURE is the music played at the beginning of a ballet or a long piece of music.

No doubt you have been aware of the music in the background as the story was being told. This music is the overture. Mr. Tchaikovsky used the overture to introduce the story. The sound of the overture is a very light, high-voiced sound, almost toy-like music. You will hear the overture again, next day.

FOURTH DAY

Music

Chapter Two

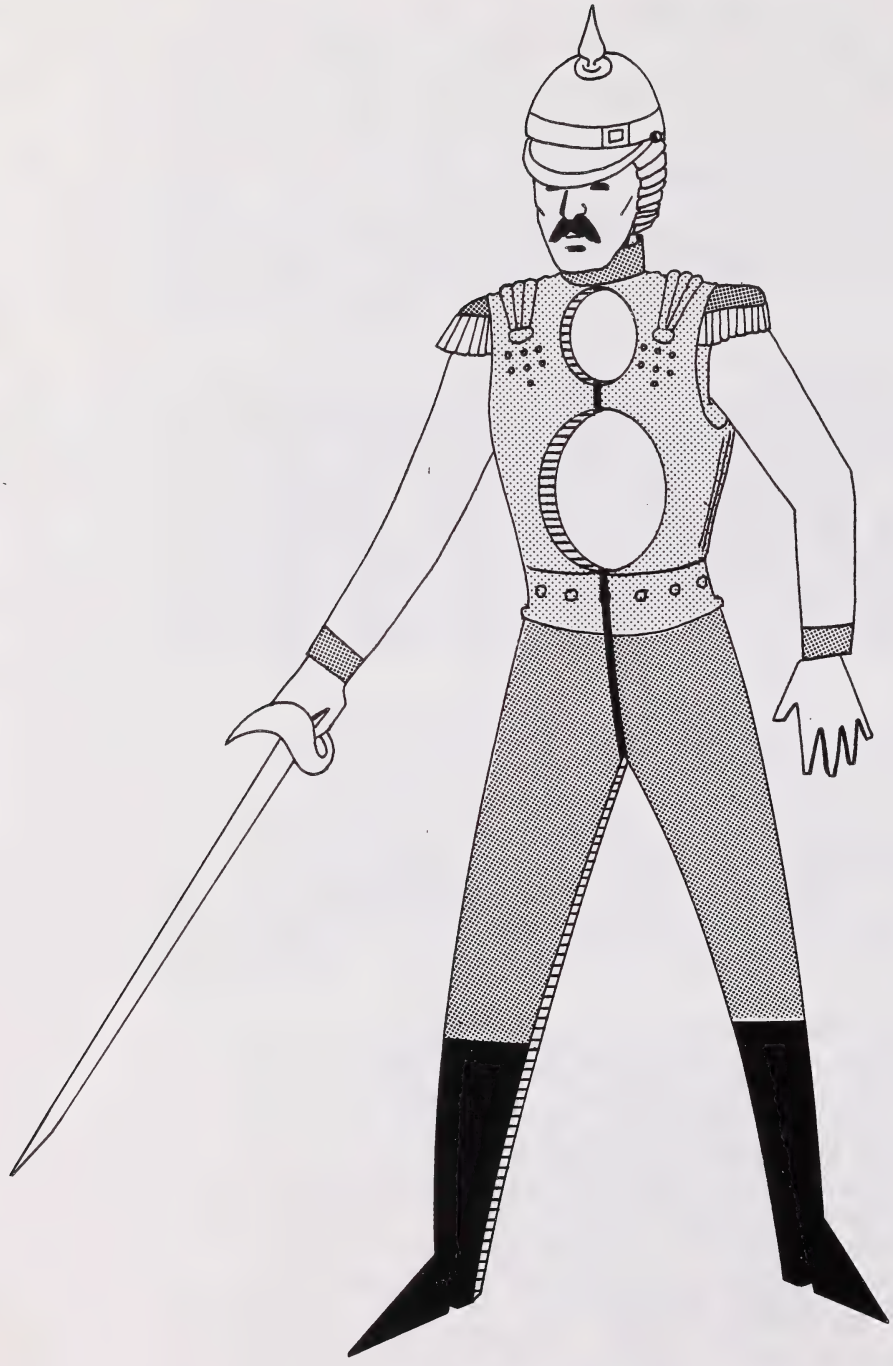
Clara's Present

*Tape On*

All the guests had finally arrived. Now the party was beginning. Old Hans, the musician, raised his fiddle to his chin, plucked the strings to see if they were in tune, and started to play. First they had musical chairs. Everyone joined in, young and old, except Granny. She was sitting in a straight-backed chair, determined not to miss a thing and thinking of the times when she had joined in the same games, many years ago. Next, came a slow stately waltz for the adults.

So the party went on with lots of games and dances, until it was time to cut down the parcels from the tree. Frank and Clara quickly snipped the strings and handed out the presents to the guests. There were road racing sets, flashlights, magnets, skates, pocket knives, fashion dolls, models, games, puzzles and many other exciting gifts. Clara thought her fashion doll was just beautiful. Frank's favorite gift was a box of fierce-looking soldiers.

After the gifts were opened it seemed like a good time for refreshments to be served. For the first time since the party began, silence fell on the room. Even the boys were quiet, for they could not make much noise with their mouths full of sandwiches and cakes. The silence did not last long, however, for Uncle William, with red face and snow-white hair, came puffing in saying, "Sorry I'm late." He always came late to these parties, for he could not come until he had served his last customer, put out the lights, and closed his shop for the Christmas holiday.



From the moment Uncle William came in, until the party was over, there was not another quiet moment. As fast as one game ended Uncle William thought of another. The time flew as they played hunt the thimble, blind man's buff and charades. In between they danced. Soon, too soon, it was time for the party to end. All the children gathered round the tree to sing for Granny. She loved to hear the young sweet voices singing the story of the first Christmas. The last carol was scarcely sung when Uncle William said, "Good grief – the presents! I almost forgot about them!" He disappeared and returned quickly with a bulging sack. There was a parcel for everyone in the room. Uncle William rushed round handing them out. "No time to undo them now," he cried. "Wait till you get home." Already the guests were leaving. As each departed into the chill night air they called back, "Thank you for a wonderful party, and A Merry Christmas to you."

"Whew," said Clara, "what a party that was! Let's open our gifts from Uncle William now."

"More soldiers," said Frank, "with the fort, drawbridge, portcullis, battlements and a cannon."

"Why whatever have I got?" cried Clara. "Why it's a nutcracker! Uncle William knows how much I love to eat nuts. Now he won't have to crack them for me."

The nutcracker was not an ordinary one either. It was made of hard darkwood and carved in the form of a soldier. Every detail was there: the helmet above the watchful eyes, the strong chin, the breast plate, the drawn sword. It seemed more ready to crack skulls than nuts.

"Let me see it," said Frank snatching the nutcracker from Clara.

"Give it back," cried Clara.

"Frank give the nutcracker back to Clara," warned their father. Clara took the nutcracker and put it carefully on a chair. Frank left his soldiers and fort on the table. Then the two of them were off to bed.

* * * * *

Do you remember the different kinds of instruments? If you don't, read the notes on pages 6 and 7, Lesson 11.

Do you think you can tell one instrument from another as the orchestra plays the Overture? Let's try. First you will listen to a small portion that the flute, clarinet, violins and triangle play in the Overture.

The flute and clarinet — The flute has a higher sound than the clarinet. Listen closely as the flute is played first. Can you tell when the flute stops and the clarinet begins?

The next instruments you will hear are the violins and triangle. The violin is a smooth sound. The triangle is a tiny tinkling sound in the background. You will have to listen very carefully to hear the triangle, since violins and the triangle are played at the same time.

Now listen to a part of the Overture again. You can play a game with your supervisor. As you listen see if you can pick out the following instruments. Tell your supervisor when you think they are being played.

- flute
- clarinet
- triangle
- violins

Music - Miniature Overture

FIFTH DAY

Music

Chapter Three

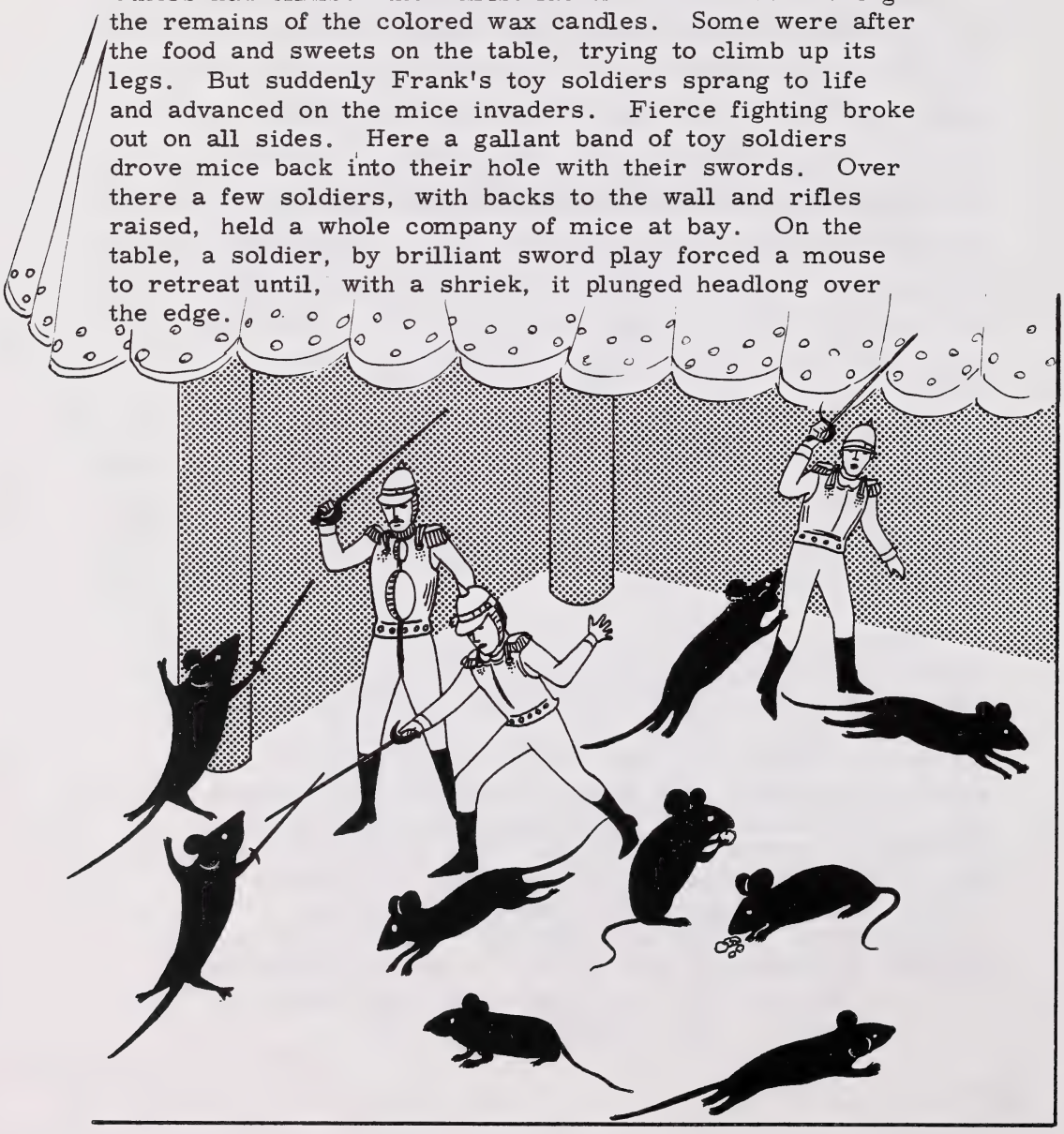
The Nutcracker and the Mouse King

*Tape On*

The family had gone to bed after the party was over. But poor Clara couldn't sleep. She tossed and turned on her bed, but the excitement of the party had left her wide awake. She tried lying first on one side, then on the other, and then on her back. She tried a high pillow, a low one, and no pillow at all. She counted hundreds of sheep, but still sleep would not come to her. She wondered what time it was, but blackness of the room only told her that it was still night. What a long night it was! Would Christmas Day ever come? Thinking of Christmas reminded Clara of the stocking hanging at the foot of the bed. She got out carefully and groped her way towards it. There it was, still flat and empty. Getting back into bed and snuggling down under the bedcovers, she started thinking about her nutcrackers. She wished she had brought one upstairs. Suddenly she decided to get one. "If I'm careful no one will hear me," she thought, "and it will only take a minute or two." Again she tossed the bedcovers aside and got out of bed. In the darkness she groped for her slippers and felt her way to the door.

Opening it slowly, an inch at a time, for fear it would squeak, Clara tiptoed on to the landing. Like a blind man she moved along towards the staircase, one hand stretched before her pawing the air, the other stroking its way along the wall. Suddenly the wall ended and she knew she had reached the stairs. She found the banisters and grasped them firmly counting the steps under her slippered feet. Suddenly the church clock struck. Was it one o'clock? No — it boomed out again. Another boom and another and another. The last stroke died away and Clara had counted twelve. It was only midnight. She had left her bedroom on Christmas Eve and now it was Christmas Day. When all was quiet she moved again and soon was at the party-room door. She opened it very quietly.

Clara's heart missed several beats. She stifled a scream. Her eyes almost popped out of her head. Brilliant moonlight lit the room and the floor was alive with hundreds of mice! They were scampering into the room from all directions, popping up through holes in the baseboard or darting through the partly-open window. The mice were on the look out for food. Some of them had already discovered bits of biscuits lying about and were sitting nibbling furiously, their tails stretched out behind them. Others had climbed the Christmas tree and were chewing the remains of the colored wax candles. Some were after the food and sweets on the table, trying to climb up its legs. But suddenly Frank's toy soldiers sprang to life and advanced on the mice invaders. Fierce fighting broke out on all sides. Here a gallant band of toy soldiers drove mice back into their hole with their swords. Over there a few soldiers, with backs to the wall and rifles raised, held a whole company of mice at bay. On the table, a soldier, by brilliant sword play forced a mouse to retreat until, with a shriek, it plunged headlong over the edge.



Watching from her corner of the room, Clara noticed one mouse much bigger and stronger than the others. He had long teeth, fierce looking whiskers and was wearing a purple cloak. He looked very important, and she felt sure he was the leader or even the King of the Mice. He was in the middle of the floor fighting a duel with...Clara rubbed her eyes and looked again. Yes it was! The King of the Mice was fighting a duel with her nutcracker soldier! Sparks flew as sword clashed upon sword. First one of them gave ground, then the other. Clara forgot everything else in the room as she watched her soldier fighting for his life. "Go on, Nutcracker, go on," she cried; "beat him, beat him!" She gasped as her nutcracker slipped and fell to the ground.

In an instant, the Mouse King had jumped on top of him and stood there laughing as he prepared to deliver the fatal blow. "I must save him," thought Clara. Taking off her slipper she threw it straight at the purple-cloaked figure. It hit him with a thwack between his beady eyes. At the same moment a dazzling light, like a great flash of lightning, hid everything from view.

What could this blinding light be? You will find out in the next lesson.

* * * * *

The music Mr. Tchaikovsky wrote for the battle between the mice and soldiers is called the March.

The first instrument you will hear is the trumpet. Following the trumpet is the skipping-like sound of the violins.

Then deep brass instruments can be heard. These are followed by deep-sounding strings and wood winds.

As you listen to the music for the March, try to march to it. You will probably have to take quick steps. Don't you think this suits the stiff quick motion of the toy soldiers in battle?

Music - March

*End of Side One*
*of the tape*

ANSWERS FOR LESSON 11

Page 5

1. A ballet is a story set to music and dance but with no words.
2. Peter Ilich Tchaikovsky

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